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Includes aeronautics (general); aerodynamics; air transportation and safety; aircraft communications and navigation; aircraft design, testing and performance; aircraft instrumentation; aircraft propulsion and power; aircraft stability and control; and research and support facilities (air).

For related information see also *Astronautics*.

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For related information see *03 Air Transportation and Safety, 16 Space Transportation,* and *44 Energy Production and Conversion.*

SPACE SCIENCES

Includes space sciences (general); astronomy; astrophysics; lunar and planetary exploration; solar physics; and space radiation.
For related information see also *Geosciences.*

88 SPACE SCIENCES (GENERAL) **N.A.**

89 ASTRONOMY **1597**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **1597**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **1599**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **1599**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **1600**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **N.A.**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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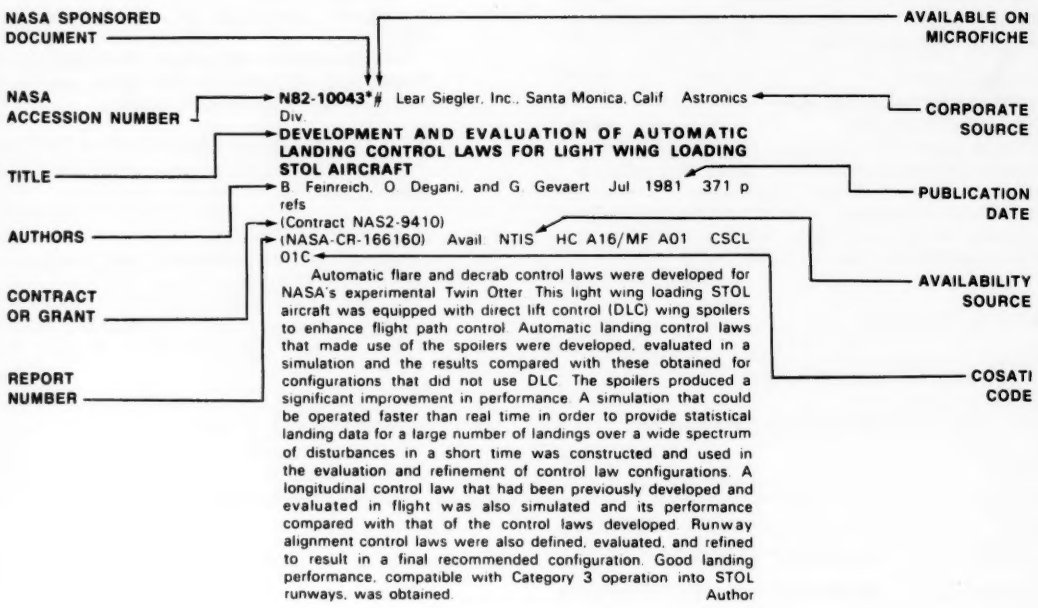
TYPICAL CITATION AND ABSTRACT


NASA SPONSORED DOCUMENT
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NASA ACCESSION NUMBER
N82-10043*# Lear Siegler, Inc., Santa Monica, Calif. Astronics Div.
CORPORATE SOURCE
TITLE
DEVELOPMENT AND EVALUATION OF AUTOMATIC LANDING CONTROL LAWS FOR LIGHT WING LOADING STOL AIRCRAFT
PUBLICATION DATE
AUTHORS
B. Feinreich, O. Degani, and G. Gevaert Jul. 1981 371 p refs
CONTRACT OR GRANT
(Contract NAS2-9410)
AVAILABILITY SOURCE
REPORT NUMBER
(NASA-CR-166160) Avail: NTIS HC A16/MF A01 CSCL 01C
COSATI CODE
Automatic flare and decrab control laws were developed for NASA's experimental Twin Otter. This light wing loading STOL aircraft was equipped with direct lift control (DLC) wing spoilers to enhance flight path control. Automatic landing control laws that made use of the spoilers were developed, evaluated in a simulation and the results compared with these obtained for configurations that did not use DLC. The spoilers produced a significant improvement in performance. A simulation that could be operated faster than real time in order to provide statistical landing data for a large number of landings over a wide spectrum of disturbances in a short time was constructed and used in the evaluation and refinement of control law configurations. A longitudinal control law that had been previously developed and evaluated in flight was also simulated and its performance compared with that of the control laws developed. Runway alignment control laws were also defined, evaluated, and refined to result in a final recommended configuration. Good landing performance, compatible with Category 3 operation into STOL runways, was obtained. Author

VOLUME 20 NUMBER 11 JUNE 8, 1982

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N82-20139# Air Force Academy, Colo. Dept. of Aeronautics.
AIR FORCE ACADEMY AERONAUTICS DIGEST FALL/SUMMER 1980 Final Report
A. M. Higgins, ed., E. J. Jumper, ed., J. M. Kempf, ed., and B. J. Gregory, ed. May 1981 149 p refs
(AD-A108338; USAFA-TR-81-4) Avail: NTIS HC A07/MF A01 CSCL 20/4

The digest includes technical papers in the specific areas of aerodynamics, propulsion, experimental instrumentation, biomechanics, engineering education, and aeronautical history. Canard wake measurements, the relation between camber and zero-lift angle of attack, and the early history of the jet engine were examined. T.M.

N82-20140# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
JOURNAL OF AERONAUTICS AND ASTRONOMY
11 Dec. 1981 183 p refs Transl. into ENGLISH from Acta Aeron. et Astronautica Sinika (China), v. 1, no. 1, 1980 104 p
(AD-A109681; FTD-ID(RS)T-0722-81) Avail: NTIS HC A09/MF A01 CSCL 20/4

Articles dealing with aerodynamics and astronomy are presented. Slender wings, axisymmetric bodies, attitude control systems and digital filters are discussed. R.J.F.

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N82-20141 California Univ., Berkeley.
VISCOUS-INVISCID INTERACTION IN TRANSONIC FLOW Ph.D. Thesis
Laurence Byron Wigton 1981 118 p
Avail: Univ. Microfilms Order No. 8200306

An inviscid two dimensional steady transonic flow calculation was coupled with a boundary layer calculation. This interaction is especially important in transonic problems since the boundary layer has a significant effect on the inviscid portion of the flow. The inviscid solution was obtained by an algorithm developed for the full potential equation by Holst and Ballhaus while the attached and separated turbulent boundary layer calculations were performed by Green's lag entrainment method. Guided by a model program suggested by Le Balleur, a viscous-inviscid coupling algorithm was developed. Theoretical analysis indicates that it coverges rapidly for attached flows and also performs well for separated flows. These conclusions were confirmed through a series of challenging transonic calculations involving both attached and separated flows. The coupling algorithm is remarkably stable and allows computation of coupled viscous-inviscid flows within times required to perform the inviscid calculations by themselves. Dissert. Abstr.

N82-20142 Ohio State Univ., Columbus.
AEROELASTIC CHARACTERISTICS OF A MISTUNED BLADED-DISC ASSEMBLY Ph.D. Thesis
Robert Evans Kielb 1981 206 p
Avail: Univ. Microfilms Order No. 8129037

The aeroelastic characteristics of mistuned bladed disc assemblies are studied by analytically modeling the bladed disc and its environment and using these models to conduct parametric studies. These studies have concentrated on the effect of mistuning on the system stability and, to a lesser extent, on the aeroelastic response. Aerodynamic coupling between the blades is investigated. Each blade is modeled as a two degree of freedom oscillator in which the airfoil is permitted to have bending (plunging) and torsional (pitching) motions which are inertially coupled. The disc is focused on and a technique is presented for calculating the free vibration frequencies and mode shapes of a rotating disc with variable thickness and temperature. The resulting model is used to study the dependency of disc modal frequency on the nodal diameter of the mode. Dissert. Abstr.

N82-20143*# McDonnell Aircraft Co., St. Louis, Mo.
TESTS AND ANALYSIS OF A VENTED D THRUST DEFLECTING NOZZLE ON A TURBOFAN ENGINE Final Report, Mar. 1980 - Mar. 1982
E. W. Roseberg Mar. 1982 78 p refs
(Contract NAS2-10564)
(NASA-CR-166279; NAS 1.26:166279; MDC-IR0280) Avail: NTIS HC A05/MF A01 CSCL 21E

The objectives were to: obtain nozzle performance characteristics in and out of ground effects; demonstrate the compatibility of the nozzle with a turbofan engine; obtain pressure and temperature distributions on the surface of the D vented nozzle; and establish a correlation of the nozzle performance between small scale and large scale models. The test nozzle was a boilerplate model of the MCAIR D vented nozzle configured for operation with a General Electric YTF-34-F5 turbofan engine. The nozzle was configured to provide: a thrust vectoring range of 0 to 115 deg; a yaw vectoring range of 0 to 10 deg; variable nozzle area control; and variable spacing between the core exit and nozzle entrance station. Compatibility between the YTF-34-T5 turbofan engine and the D vented nozzle was demonstrated. Velocity coefficients of 0.96 and greater were obtained for 90 deg of thrust vectoring. The nozzle walls remained cool during all test conditions. T.M.

N82-20144*# Boeing Military Airplane Development, Seattle, Wash.
PROCEDURES FOR THE COMPUTATION OF UNSTEADY TRANSONIC FLOWS INCLUDING VISCOUS EFFECTS Final Report
Donald P. Rizzetta Jan. 1982 76 p refs
(Contract NAS2-10762)
(NASA-CR-166249; NAS 1.26:166249) Avail: NTIS

HC A05/MF A01 CSCL 01A

Modifications of the code LTRAN2, developed by Ballhaus and Goorjian, which account for viscous effects in the computation of planar unsteady transonic flows are presented. Two models are considered and their theoretical development and numerical implementation is discussed. Computational examples employing both models are compared with inviscid solutions and with experimental data. Use of the modified code is described.Author

N82-20145*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

PRELIMINARY INVESTIGATION OF EFFECTS OF HEAVY RAIN ON THE PERFORMANCE OF AIRCRAFT

Otto W. K. Lee Feb. 1982 16 p refs

(NASA-TM-83272; NAS 1.15:83272) Avail: NTIS HC A02/MF A01 CSCL 01C

A guideline was defined for the analysis of flight data to determine the effects of rain on the aerodynamic performance of an aircraft. It distinguishes and separates the effects of horizontal wind shears, downdrafts, gusts at the phugoid frequency, and rain based on various aerodynamic parameters. Flight data from NASA LaRC's TCV B-737 were inconclusive because precipitation rates encountered probably were not high enough. However, the guideline seemed to be valid and can be used on further flight data evaluations. Difficulties in this type of data analysis are discussed. Other indirect influences of rain on the degradation of airplane performance are also considered. Author

N82-20146# National Aeronautical Establishment, Ottawa (Ontario). High Speed Aerodynamics Section.

EVALUATION OF THREE-DIMENSIONAL WALL INTERFERENCE CORRECTIONS FROM BOUNDARY PRESSURE MEASUREMENTS

M. Mokry Nov. 1980 31 p refs

(LTR-HA-51) Avail: NTIS HC A03/MF A01

Subsonic wall interference corrections are evaluated using the Fourier solution for the Dirichlet problem in the circular cylinder, interior to a three dimensional test section. The required boundary values of the streamwise component of wall interference velocity are obtained from static pressure measurements along four generators of the cylinder. The coefficients of the resultant Fourier-Bessel series are obtained in closed form and the coefficients of the Fourier sine series are calculated by the fast Fourier transform, so that the method is very efficient and suitable for routine three dimensional wind tunnel testing. The feasibility and accuracy of the method is demonstrated on the theoretical example of a cylindrical closed wall test section. S.L.

N82-20147*# Stanford Univ., Calif. Joint Inst. for Aeronautics and Acoustics.

AN EXPERIMENTAL INVESTIGATION OF THE FLOW PAST A FINITE CIRCULAR CYLINDER AT A LOW SUBCRITICAL REYNOLDS NUMBER

M. Budair, A. Ayoub, and K. Karamcheti Jun. 1981 138 p refs

(Contract NCC2-75)

(NASA-CR-168661; NAS 1.26:168661; SU-JIAA-TR-40) Avail: NTIS HC A07/MF A01 CSCL 01A

Results of hot wire measurements made in the near wake at a Reynolds number of 9955 are reported. The measurements include the mean velocity profiles, root mean square values of the velocity fluctuations, frequency spectra, and velocity cross correlations. The mean velocity profiles were used to determine the wake width, whose variation in the downstream and spanwise directions was examined. It is observed that close to the cylinder, the wake is narrower toward the free end than it is away from it, while further downstream the wake is wider toward the tip than it is away from it. It is found that the flow over the span can be characterized by four regions: a tip region where vortex shedding occurs at a lower frequency than that prevalent for away from the tip; an intermediate region adjacent to the first one where a frequency component of a nonshedding character is present; a third region characterized by a gradually increasing shedding frequency with increasing distance from the tip; and a two dimensional region where the shedding frequency is constant. T.M.

N82-20148*# Stanford Univ., Calif. Joint Inst. for Aeronautics and Acoustics.

THE AERODYNAMICS OF CIRCULATION CONTROL

N. J. Wood Jul. 1981 366 p refs

(Contract NCC2-89)

(NASA-CR-168662; NAS 1.26:168662; SU-JIAA-TR-41) Avail: NTIS HC A16/MF A01 CSCL 01A

Two dimensional subsonic wind tunnel tests were conducted on a 20% thickness: chord ratio circulation controlled elliptic aerofoil section equipped with forward and reverse blowing slots. Overall performance measurements were made over a range of trailing edge blowing momentum coefficients from 0 to 0.04; some included the effect of leading edge blowing. A detailed investigation of the trailing edge wall jet, using split film probes, hot wire probes and total head tubes, provided measurements of mean velocity components, Reynolds normal and shear stresses, and radial static pressure. The closure of the two dimensional angular momentum and continuity equations was examined using the measured data, with and without correction, and the difficulty of obtaining a satisfactory solution illustrated. Suggestions regarding the nature of the flow field which should aid the understanding of Coanda effect and the theoretical solution of highly curved wall jet flows are presented. Author

N82-20149*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

LAMINAR FLOW CONTROL. THE RESEARCH AND TECHNOLOGY STUDIES 1981

Dal V. Maddalon, ed. Mar. 1982 135 p refs Proceedings of Conf. held at Dryden Flight Research Center, Edwards, Calif., 17-18 Sep. 1981

(NASA-CP-2218; NAS 1.55:2218; L-15084) Avail: NTIS HC A07/MF A01 CSCL 01A

Laminar flow airfoil design and construction, boundary layer control characteristics, and construction materials and methods are discussed. For individual titles, see N82-20150 through N82-20155.

N82-20150*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

NASA LANGLEY LAMINAR FLOW CONTROL AIRFOIL EXPERIMENT

W. D. Harvey and J. D. Pride *In its* Laminar Flow Control Mar. 1982 p 1-42 refs (For primary document see N82-20149 11-02)

Avail: NTIS HC A07/MF A01 CSCL 01A

The design and construction of an advanced swept supercritical airfoil for commercial aircraft to be tested in a transonic wind tunnel is described. The swept LFC airfoil was designed for a given thickness ratio and lift coefficient, with emphasis placed on high critical Mach number with shock-free flow. It is compatible with satisfactory low speed and buffeting characteristics and minimizing the suction laminarization. Further emphasis was placed on achieving shock-free flow over a wide range of off-design conditions including trailing edge flap control. The requirements and design of the suction system and modifications to the Langley 8 foot transonic pressure tunnel is briefly described. Contouring of nonporous test section walls for free air simulation and flow quality improvements is included. J.D.H.

N82-20151*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

STATUS OF NASA ADVANCED LFC AIRFOIL HIGH-LIFT STUDY

Zachary T. Applin *In its* Laminar Flow Control Mar. 1982 p 43-62 refs (For primary document see N82-20149 11-02)

Avail: NTIS HC A07/MF A01 CSCL 01A

The design of a high lift system for the NASA advanced LFC airfoil designed by Pfenninger is described. The high lift system consists of both leading and trailing edge flaps. A 3 meter semispan, 1 meter chord wing model using the above airfoil and high lift system is under construction and will be tested in the NASA Langley 4 by 7 meter tunnel. This model will have two separate full span leading edge flaps (0.10c and 0.12c) and one full span trailing edge flap (0.25c). The performance of this high lift system was predicted by the NASA two dimensional viscous multicomponent airfoil program. This program was also used to predict the characteristics of the LFC airfoils developed

by the Douglas Aircraft Company and Lockheed-Georgia Aircraft Company. J.D.H.

N82-20152*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Sciences and Mechanics.
STABILITY OF BOUNDARY LAYERS WITH POROUS SUCTION STRIPS: EXPERIMENT AND THEORY
G. A. Reynolds, W. S. Saric, H. L. Reed, and A. H. Nayfeh *In* NASA. Langley Research Center Laminar Flow Control Mar. 1982 p 63-74 ref (For primary document see N82-20149 11-02)
(Grants NsG-1608; NsG-1255; Contract N00014-75-C-0381) Avail: NTIS HC A07/MF A01 CSCL 01A

Low turbulence tunnel experiments on the stability and transition of 2 D boundary layers on flat plates with and without suction are described. A number of general suction cases are discussed. Test results showed that the maximum stabilization occurred when the suction was moved toward the Branch I neutral point. An analytical study of the stability of two dimensional, incompressible boundary layer flows over plates with suction through porous strips was performed. The mean flow was calculated using linearized triple deck, closed form solutions. The stability results of the triple deck theory are shown to be in good agreement with those of the interacting boundary layers. An analytical optimization scheme for the suction configuration was developd. Numerical calculations were performed corresponding to the experimental configurations. In each case, the theory correctly predicts the experimental results. J.D.H.

N82-20153*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
PROBABILITY OF LAMINAR FLOW LOSS BECAUSE OF ICE CRYSTAL ENCOUNTERS
Richard E. Davis *In its* Laminar Flow Control Mar. 1982 p 75-94 refs (For primary document see N82-20149 11-02)
Avail: NTIS HC A07/MF A01 CSCL 01A

A method for combining the cloud detector observation results from the Global Atmospheric Sampling Program (GASP) with Knollenberg probe observations of cloud particle concentration from other programs to derive estimates of the ambient concentration of particles larger than a given size was developed. The method was applied to estimate the probability of encountering particle concentrations which would degrade the performance of laminar flow control (LFC) aircraft. It is concluded that LF loss should occur only about one percent of the time in clear air and that flight within clouds should always result in a significant loss of LF, with 90 percent LF loss occurring about one percent of the time. Preliminary estimates of cloud encounter probability are presented for four airline routes, and conclusions are presented as to the best altitudes for cloud avoidance in extratropical and tropical latitudes. Author

N82-20154*# Rockwell International Corp., Los Angeles, Calif. Aircraft Div.
SPF/DB TITANIUM CONCEPTS FOR STRUCTURAL EFFICIENCY FOI HC
V. E. Wilson *In* NASA. Langley Research Center Laminar Flow Control Mar. 1982 p 95-110 (For primary document see N82-20149 11-02)
Avail: NTIS HC A07/MF A01 CSCL 01A

Illustrations for a presentation on superplastic forming/diffusion bonding titanium design concepts are presented. Sandwich skin panels with hat section, semicircular corrugation, sine wave, and truss cores are shown. The fabrication of wing panels is illustrated, and applications to the design of advanced variable sweep bombers summarized. J.D.H

N82-20155*# McDonnell-Douglas Corp., Long Beach, Calif.
SPF/DB TITANIUM LFC POROUS PANEL CONCEPT
Neil R. Williams *In* NASA. Langley Research Center Laminar Flow Control Mar. 1982 p 111-138 (For primary document see N82-20149 11-02)
Avail: NTIS HC A07/MF A01 CSCL 01A

Illustrations for a presentation demonstrating superplastic forming/diffusion bonding titanium porous panels are presented. Fabrication phases, sandwich panels, load bearing qualities, microstructure, and panel surface after finishing are illustrated. J.D.H.

N82-20156*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
STATIC INTERNAL PERFORMANCE OF SINGLE EXPANSION-RAMP NOZZLES WITH THRUST VECTORING AND REVERSING
Richard J. Re and Bobby L. Berrier Mar. 1982 143 p refs (NASA-TP-1962; L-14902; NAS 1.60:1962) Avail: NTIS HC A07/MF A01 CSCL 01A

The effects of geometric design parameters on the internal performance of nonaxisymmetric single expansion-ramp nozzles were investigated at nozzle pressure ratios up to approximately 10. Forward-flight (cruise), vectored-thrust, and reversed-thrust nozzle operating modes were investigated. B.W.

N82-20157# Transportation Systems Center, Cambridge, Mass. Research and Special Programs Administration.
CHICAGO MONOSTATIC ACOUSTIC VORTEX SENSING SYSTEM. VOLUME 2: DECAY OF B-707 AND DC-8 VORTICES Final Report, Oct. 1976 - Dec. 1979
D. C. Burnham and J. N. Hallock Washington FAA Sep. 1981 136 p refs
(AD-A109518; DOT-TSL-FAA-79-18-Vol-2; FAA-RD-79-103-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 01/2

A Monostatic Acoustic Vortex Sensing System (MAVSS) was installed at Chicago's O'Hare International Airport to measure the strength and decay of aircraft wake vortices from landing aircraft. The MAVSS consists of an array of acoustic antennas which measure the vertical profile up to 60-m altitude of the vertical component of the wind. The decay in wake vortex strength is measured as the vortex passes over successive antennas in the array. In this volume, the data are analyzed to examine whether landing B-707 and DC-8 aircraft need to be divided into Heavy and non-Heavy categories on the basis of wake vortex hazard. Volume I (published in October 1979) described the MAVSS principles of operation, the hardware developed, and the data reduction methods employed. GRA

N82-20158# Calspan Field Services, Inc., Arnold Air Force Station, Tenn. AEDC Div.
AERODYNAMIC CHARACTERISTICS AND STORE LOADS OF A 1/24 SCALE F-111 AIRCRAFT MODEL WITH THREE EXTERNAL STORE LOADINGS Final Report
C. F. Anderson AEDC Jul. 1981 41 p refs Sponsored by Air Force
(AD-A109449; AEDC-TSR-81-P30) Avail: NTIS HC A03/MF A01 CSCL 02/4

The 1/24 scale F-111 aircraft model was tested in the Aerodynamic Wind Tunnel (4T) to obtain simultaneous measurements of the aircraft and store aerodynamic loads. Static stability and store loads data were obtained at 4 wind sweep angles for Mach numbers from 0.6 to 1.2. The angle of attack was varied from -2 to 24 deg and the angle of sideslip was varied from -10 to 10 deg. Author (GRA)

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation*.

N82-20159# Committee on Commerce, Science, and Transportation (U. S. Senate).
FUTURE OF GENERAL AND COMMUTER AVIATION TECHNOLOGY AND TRADE
Washington GPO 1981 317 p refs Joint hearing before the Subcomm. on Transportation, Aviation and Materials of the Comm. on Sci. and Technol. and the Subcomm. on Aviation of the Comm. on Commerce, Sci., and Transportation, 97th Congr., 1st Sess., No. 42, 27 Aug. 1981
(GPO-85-832) Avail: Subcomm. on Transportation, Aviation and Materials

Problems affecting the aircraft industry are discussed and

include Federal tax laws, interest rates, fuel costs, and government involvement in civil aviation. Aeronautical research programs and the funding that they receive were reviewed. The economic contribution of general aviation is considered and ways in which government can assist the general aviation industries are highlighted. T.M.

N82-20160# Naval Ocean Systems Center, San Diego, Calif. Bioacoustics and Bionics Div.
PROJECT SEA HUNT: A REPORT ON PROTOTYPE DEVELOPMENT AND TESTS Final Report, 1979 - 1980
J. V. Simmons, Jr. Jul. 1981 66 p refs
(AD-A109510; NOSC/TR-746) Avail: NTIS HC A04/MF A01 CSCL 06/7

During FY 79-80, a prototype Sea Hunt system was built and tested. Sea Hunt utilizes trained pigeons carried in a container attached to the underside of a helicopter to locate objects colored red, yellow or orange. Development of hardware and pigeon training methods are presented. Conclusions based on test data are: Sea Hunt improves detection and localization of appropriate targets; the system is reliable and easily serviced and maintained. A recommendation is made to conduct operational field testing of Sea Hunt at a Coast Guard air station. GRA

N82-20161# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
DEVELOPMENT OF AN EJECTION SEAT BALLAST BLOCK FOR THE S-3A AIRCRAFT Final Report
Dan Lorch 4 Nov. 1981 18 p
(AD-A109808; NADC-81272-60) Avail: NTIS HC A02/MF A01 CSCL 01/3

The purpose of this Ballast Block is to ballast an unoccupied ejection seat in the S-3A aircraft. The block adjusts the mass of the seat and the center of gravity to fall within acceptable limits to prevent rapid seat acceleration and tumbling both of which might cause interference with an ejected occupied seat. Author (GRA)

N82-20162# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
DEVELOPMENT OF A SUPPORTED AIRBAG EJECTION RESTRAINT (SABER) FOR WINDBLAST PROTECTION
Dan Lorch 4 Nov. 1981 22 p refs
(AD-A109807; NADC-81274-60) Avail: NTIS HC A02/MF A01 CSCL 01/3

This is a preliminary investigation to develop an airbag mounted on an ejection seat. The airbag is designed to deploy during an emergency ejection and may provide both prepositioning of the aircrewman and windblast protection for his upper torso. The airbag is tightly packed on a flexible steel strap which is mounted at the aircrewman's shoulder level. Quick disconnect fittings on either side permit the crewmen to enter the seat; they also disconnect the entire system upon seat/man separation. Author (GRA)

N82-20163# National Oceanic and Atmospheric Administration, Norman, Okla.
DOPPLER RADAR-RESEARCH AND APPLICATION TO AVIATION FLIGHT SAFETY, 1977 - 1979 Final Report
J. T. Lee Jun. 1981 45 p refs
(Contract DOT-FA77WAI-808)
(AD-A109845; FAA-RD-81-79) Avail: NTIS HC A03/MF A01 CSCL 17/9

Thunderstorm turbulence detection and the display of the turbulence location offer a significant advance toward improvement in flight safety and utilization of critical air space. A cooperative program involving the Federal Aviation Administration, U.S. Air Force's Aeronautical Systems Command, and the National Oceanic and Atmospheric Administration's National Severe Storms Laboratory has been conducted under a code name of 'Rough Rider'. An F-4-C aircraft instrumented to record turbulence, temperature and wind during thunderstorm penetrations has been used to obtain in situ measurements of these parameters concurrently with Doppler and conventional weather radar observations. The results of this program indicate that the Doppler measured radial wind component's spectral width holds promise as a turbulence indicator. Turbulence of the severe or greater nature was always accompanied by spectral widths greater than 4 m/s. A second part of the program was to display forenoted Doppler radar data in real time at a Radar Approach Control office and at an Air Route Traffic Control Center. This display provided an insight into requirements for an operational system. Author (GRA)

N82-20164# Environmental Research and Technology, Inc., Concord, Mass.
DETECTION AND TRACKING ALGORITHM REFINEMENT Final Technical Report
G. B. Gustafson and R. K. Crane Washington DOT Oct. 1981 194 p refs
(Contracts DTFA01-81-Y-10521; NA-81-RAC-00072)
(AD-A109517; ERT-P-B035; FAA-RD-81-80) Avail: NTIS HC A09/MF A01 CSCL 01/2

A previous aircraft hazard detection algorithm shown to have high detectability but with a high false alarm rate has been modified to improve reliability for aircraft warnings. The derived Doppler parameter tangential (or radial) shear is incorporated as a radar cell attribute and used in the determination of significant hazard. Further modifications to the processing structure allow for radar operation in a non-automatic mode, thereby accommodating arbitrary changes in PRF, integrator type or scan geometry. A revised output format provides a sorted hierarchical list of derived meteorological structures in a form readily adapted to a graphics display. Author (GRA)

N82-20165# Army Test and Evaluation Command, Fort Huachuca, Ariz.
SAFETY (AVIATION MATERIAL) Final Report
18 Jan 1982 45 p
(AD-A110361) Avail: NTIS HC A03/MF A01 CSCL 01/2

Existing test methodology and techniques necessary to determine the degree to which aviation material meets the safety requirements stated in the requirements documents are discussed. These procedures cover the requirements, aircraft armaments, airframes, ejection seats, and electrical, mechanical, and miscellaneous hazards related to Army aircraft. A guide for laser safety is included. R.J.F.

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N82-20166 Ohio Univ., Athens.
UTD TERRAIN REFLECTION MODEL WITH APPLICATION TO ILS GLIDE SLOPE Ph.D. Thesis
Vichate Ungvichian 1981 279 p
Avail: Univ. Microfilms Order No. 8126070

A terrain reflection model based on the uniform theory of diffraction (UTD) is described which can accommodate any piecewise linear terrain profile, requires less computer time than the physical optics models, is capable of including transverse terrain effects, and determines the reflected fields with all important diffraction and blockage effects included. The results when compared to measurements indicate that this UTD model can accurately predict ILS flight path effects due to ground irregularity. Futhermore, the results obtained from this UTD model are compared against the predictions of a previously developed physical optics (PO) model. UTD and PO predictions in most cases agree with one another, but better results are obtained from the UTD model for truncated or severely upsloping terrain. Dissert. Abstr.

N82-20167# Committee on Science and Technology (U. S. House).
AIR TRAFFIC CONTROL EN ROUTE COMPUTER MODERNIZATION
Washington GPO 1981 28 p Report presented by the

Subcomm. on Transportation, Aviation, and Materials of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., Aug. 1981 (GPO-82-773) Avail: Subcomm. on Transportation, Aviation, and Materials

The need for full modernization and replacement of the enroute computers is discussed. Interim replacement options are considered. The service life of the current system and the FAA's ability to manage the enroute computer modernization were examined. Anticipated costs and computer outages are presented. It is concluded that proceeding with full modernization is the best way to achieve needed productivity benefits and assure continued safe operation in the enroute airspace. T.M.

N82-20168# Committee on Science and Technology (U. S. House).

FAA AIR TRAFFIC CONTROL COMPUTER MODERNIZATION

Washington GPO 1981 101 p Hearings before the Subcomm. on Transportation, Aviation and Materials of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 13, 16-18 Jun. 1981 (GPO-82-375) Avail: Subcomm. on Transportation, Aviation and Materials

The issues of air traffic safety, the separation of air traffic, and the movement of traffic from one part of the country to another, are discussed. The proposed computer system was examined. Questions concerning whether the current system can be safely operated while a new system is being implemented and whether the overall cost effectiveness of the new system is adequate, are considered. The FAA's plans were reviewed along with its management of the current system. T.M.

N82-20169# Committee on Science and Technology (U. S. House).

AIRCRAFT COLLISION AVOIDANCE AND AIR TRAFFIC SAFETY

Washington GPO 1982 80 p Hearing before the Subcomm. on Transportation Aviation and Materials of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 52, 2 Sep. 1981 (GPO-88-545) Avail: Subcomm. on Transportation, Aviation and Materials

The threat alert and collision avoidance system is examined. The technical and policy aspects of air transportation safety are reviewed. S.L.

N82-20170*# Analytical Mechanics Associates, Inc., Hampton, Va.

THE PROCESSING OF IMU DATA IN ENTREE IMPLEMENTATION AND PRELIMINARY RESULTS

Michael L. Heck Oct. 1980 19 p refs
(Contract NAS1-16087)
(NASA-CR-165879; NAS 1.26:165879; AMA-80-23) Avail: NTIS HC A02/MF A01 CSCL 17G

It is demonstrated that the shuttle entry trajectory can be accurately represented in ENTREE with IMU data available postflight. The IMU data consist of platform to body quaternions, and accumulated sensed velocities in mean of fifty (M50) coordinates approximately every second. The preprocessing software required to incorporate the IMU data in ENTREE is described as well as the relatively minor code changes to the ENTREE program itself required to process the IMU data. Code changes to the ENTREE program and input tape data format and content changes are described. S.L.

N82-20171*# Analytical Mechanics Associates, Inc., Hampton, Va.

FORMULATION OF ADDITIONAL OBSERVABLES FOR ENTREE

John T. Findlay and Michael L. Heck Sep. 1980 12 p refs (Contract NAS1-16087)
(NASA-CR-165880; NAS 1.26:165880; AMA-80-16) Avail: NTIS HC A02/MF A01 CSCL 17G

The S-band X and Y angles, SAMS, and TACAN range and bearing were incorporated into the ENTREE software for use by experimenters at LaRC for entry trajectory reconstruction purposes. Background discussions present the need for this added capability. Formulations for the various observables are presented. Both north-south and east-west antenna mounts were provided for in the S-band angle computations. Sub-vehicle terrain height variations are included in the SAMS model. Local magnetic variations were incorporated for the TACAN bearing computations. Observable formulations are discussed in detail along with the partial computations. T.M.

N82-20172# Transportation Systems Center, Cambridge, Mass. Research and Special Programs Administration.

STATISTICAL ANALYSIS AND TIME SERIES MODELING OF AIR TRAFFIC OPERATIONS DATA FROM FLIGHT SERVICE STATIONS AND TERMINAL RADAR APPROACH CONTROL FACILITIES: TWO CASE STUDIES Final Report, Oct. 1979 - Sep. 1980

Norman J. Meyerhoff and George H. Wang Washington FAA Oct. 1981 60 p refs
(AD-A109873; TSC-FAA-81-18; DTS-522; DOT-FAA-EM-82-13) Avail: NTIS HC A04/MF A01 CSCL 17/7

Two statistical procedures have been developed to estimate hourly or daily aircraft counts. These counts can then be transformed into estimates of instantaneous air counts. The first procedure estimates the stable (deterministic) mean level of hourly or day of the week patterns by statistical models. The second procedure estimates both deterministic and stochastic periodic (hourly or day of the week) patterns by stochastic time series models. Both statistical procedures have been used to analyze traffic at the St. Louis TRACON and Los Angeles Flight Service Station. This report analyzes hourly variations in operations at the St. Louis TRACON, for each day in four representative months in 1979. It also analyzes daily variations for three months in 1979 of flight plan activity at the Los Angeles FSS. The results of these analyses are given preliminary interpretations, and are available for possible application to other facilities. They are also available for other applications, such as estimation of instantaneous air counts in hubs. GRA

N82-20173# Federal Aviation Administration, Washington, D.C. Systems Research and Development Service.

OPERATIONAL DELAY DAY FORECASTS FOR THE 20 AIR ROUTE TRAFFIC CONTROL CENTERS FOR THE YEAR 1982 THROUGH 2011 Final Report

W. Livingston Jun. 1981 24 p refs
(AD-A109844; FAA-RD-81-93) Avail: NTIS HC A02/MF A01 CSCL 17/7

The effect of forecasts of increased traffic growth at each of the 20 CONUS Air Route Traffic Control Centers has been examined to determine the impact upon processor utilization of the Central Computer Complex at each center. The study assumes continuation of the current operational capabilities and procedures at each center, and is based upon field data collected between June 1980 and January 1981, and the June 1981 forecast of the IFR aircraft handled at the 20 Air Route Traffic Control Centers. Other factors such as channel utilization are not included in this phase of the study. Author (GRA)

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics.*

N82-20174*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SIMULATION OF THE XV-15 TILT ROTOR RESEARCH AIRCRAFT

Gary B. Churchill (Army Aeromechanics Lab., Moffett Field, Calif.) and Daniel C. Dugan Mar. 1982 23 p refs
(NASA-TM-84222; A-8848; NAS 1.15:84222) Avail: NTIS HC A02/MF A01 CSCL 01C

The effective use of simulation from issuance of the request for proposal through conduct of a flight test program for the XV-15 Tilt Rotor Research Aircraft is discussed. From program inception, simulation complemented all phases of XV-15 development. The initial simulation evaluations during the source evaluation board proceedings contributed significantly to perfor-

mance and stability and control evaluations. Eight subsequent simulation periods provided major contributions in the areas of control concepts; cockpit configuration; handling qualities; pilot workload; failure effects and recovery procedures; and flight boundary problems and recovery procedures. The fidelity of the simulation also made it a valuable pilot training aid, as well as a suitable tool for military and civil mission evaluations. Simulation also provided valuable design data for refinement of automatic flight control systems. Throughout the program, fidelity was a prime issue and resulted in unique data and methods for fidelity evaluation which are presented and discussed. R.J.F.

N82-20175*# National Aeronautics and Space Administration, Washington, D. C.
FATIGUE ANALYSIS OF COMPOSITE MATERIALS USING THE FAIL-SAFE CONCEPT
G. Stievenard Jan. 1982 11 p Transl. into ENGLISH of AGARD Rept. AGARD-CP-297 (France), Mar. 1981 p 1-15 Translation was announced as N81-26131 Transl. by SCITRAN, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-76671; NAS 1.15:76671) Avail: NTIS HC A02/MF A01 CSCL 11D

If R1 is the probability of having a crack on a flight component and R2 is the probability of seeing this crack propagate between two scheduled inspections, the global failure regulation states that this product must not exceed 0.0000001. R.J.F.

N82-20176# Aeronautical Research Labs., Melbourne (Australia).
SEA KING FLIGHT TESTS PITOT-STATIC PROBE AND DIRECTIONAL VANE INSTRUMENTATION
D. T. Hourigan and M. J. Williams Jul. 1981 26 p refs
(AD-A109427; ARL/AERO-TM-332; AR-002-298) Avail: NTIS HC A03/MF A01 CSCL 01/3

A short description is given of the pitot-static pressure probe and vanes mounted on a nose boom for Sea King flight tests. Also described is a probe which was trailed below the aircraft to determine the position error of the boom probe. Results of wind tunnel calibrations of these probes are given. Author (GRA)

N82-20177# Aeronautical Research Labs., Melbourne (Australia).
BOOM PROBE POSITION ERROR CORRECTIONS FOR SEA KING Mk 50 FLIGHT TESTS
M. J. Williams Jul. 1981 34 p refs
(AD-A109428; ARL/AERO-TM-331; AR-002-297) Avail: NTIS HC A03/MF A01 CSCL 01/3

Position error has been determined for a nose-boom mounted pitot static probe installed on a Sea King Mk. 50 helicopter. The error is sensibly constant in the speed range 35 - 110 knots and is unchanged in climb and descent. Corrections to be applied to indicated nose boom values are 7.5 knots in velocity, and up to 80 ft. in altitude. Author (GRA)

N82-20178# Analytical Methods, Inc., Redmond, Wash.
A SURFACE SINGULARITY METHOD FOR ROTORS IN HOVER OR CLIMB Final Report, 29 Mar. 1979 - 30 Sep. 1981
J. Summa and Brian Maskew Dec. 1981 142 p refs
(Contract DAAJ02-76-C-0069; DA Proj. 1F2-62209-AH-76)
(AD-A109687; AMI-8103; USAAVRADCOM-TR-81-D-23) Avail: NTIS HC A07/MF A01 CSCL 20/4

A surface singularity potential flow code, ROTAIR, has been assembled for the calculation of detailed surface pressures on rotors in hover or climb. This method is basically a marriage of two codes: the fixed-wing surface singularity doublet code and the rotor lifting-surface code. The program includes a tip vortex separation model. Also, the rotor tip surface is panelled so that pressures are calculated right around the tip-edge surface. Preliminary calculations have verified the capabilities of the program for computing blade surface properties in the presence of a close-vortex passage. Additionally, calculated pressure distributions compare favorably with experimental data for a low aspect ratio two-bladed rotor, and the calculated circulation distribution is consistent with that computed earlier with the lifting-surface code. Finally, the newly developed far-wake doublet model promises to keep computing efforts practical.
Author (GRA)

N82-20179# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
A SHORT TAKEOFF PERFORMANCE COMPUTER PROGRAM Final Report
David Bruce Kobus 25 Nov. 1981 122 p refs
(ZR020302)
(AD-A109861; NADC-81259-60) Avail: NTIS HC A06/MF A01 CSCL 01/3

A short takeoff performance computer program has been developed by NAVAIRDEVCEN to be used for performance estimation and conceptual aircraft design. Author (GRA)

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N82-20180*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SIMULATOR STUDY OF A PICTORIAL DISPLAY FOR GENERAL AVIATION INSTRUMENT FLIGHT
James J. Adams Mar. 1982 59 p refs
(NASA-TP-1963; L-14675; NAS 1.60:1963) Avail: NTIS HC A04/MF A01 CSCL 01D

A simulation study of a computer drawn pictorial display involved a flight task that included an en route segment, terminal area maneuvering, a final approach, a missed approach, and a hold. The pictorial display consists of the drawing of boxes which either move along the desired path or are fixed at designated way points. Two boxes may be shown at all times, one related to the active way point and the other related to the standby way point. Ground tracks and vertical profiles of the flights, time histories of the final approach, and comments were obtained from time pilots. The results demonstrate the accuracy and consistency with which the segments of the flight are executed. The pilots found that the display is easy to learn and to use; that it provides good situation awareness, and that it could improve the safety of flight. The small size of the display, the lack of numerical information on pitch, roll, and heading angles, and the lack of definition of the boundaries of the conventional glide slope and localizer areas were criticized. A.R.H.

N82-20181# Arizona Univ., Tucson. Optical Sciences Center.
DESIGN OF A CATADIOPTRIC VCASS HELMET-MOUNTED DISPLAY Final Report, 15 Feb. 1978 - 15 Sep. 1979
R. A. Buchroeder, G. W. Seeley, and D. Vukobratovich , Wright-Patterson AFB, Ohio AFAMRL Nov. 1981 73 p refs
(Contract F33615-78-C-0520; AF Proj. 7184)
(AD-A109431; AFAMRL-TR-81-133) Avail: NTIS HC A04/MF A01 CSCL 01/3

A new wide-angle, dual-eye, helmet-mounted display has been designed. Two images combine, with a 15 deg. central field overlap, to provide a panoramic display 102 deg. wide by 45 deg. tall, with a resolution to approximately 1000 TV lines per eye. The image-generating device is a miniature 18 mm CRT. The optics, which are symmetrical for both eyes, comprise partially reflective plastic reflectors, five small glass lens elements, and a 2:1 fiber optic magnifier. A 12 mm exit pupil is obtained with enough eye relief to permit the user to wear glasses, with an interpupillary adjustment of 58 to 73 mm. Total weight of the device, not including the Air Force flight helmet type HGU-2A/P upon which it is mounted, is less than 3 pounds.
Author (GRA)

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-20182*# National Aeronautics and Space Administration, Washington, D. C.

CONDITIONS OF GENERATION AND METHODS OF DAMPING THE INLET VORTEX OF A TURBOJET ENGINE

Tadeusz Gajewski Mar. 1982 14 p refs Transl. into ENGLISH from Tech. Lotnicza Astronaut. (Poland), v. 35, no. 11, Nov. 1980 p 5-8 Translation was announced as A81-19442 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3541)

(NASA-TM-76678; NAS 1.15:76678) Avail: NTIS HC A02/MF A01 CSCL 21E

An aeromechanical analysis of the generation of an inlet vortex in a turbojet engine is presented. Methods for the prevention of vortex generation and methods of vortex damping are described. Author

N82-20183*# National Aeronautics and Space Administration, Marshall Space Flight Center, Huntsville, Ala.

DAMPING SEALS FOR TURBOMACHINERY

George L. vonPragenau Mar. 1982 28 p refs

(NASA-TP-198; NAS 1.60:198) Avail: NTIS HC A03/MF A01 CSCL 21E

A rotor seal is proposed that restricts leakage like a labyrinth seal, but extends the stabilizing speed range beyond twice the first critical speed. The dynamic parameters were derived from bulk flow equations without requiring a dominant axial flow. The flow is considered incompressible and turbulent. Damping seals are shown to be feasible for extending the speed range of high performance turbomachinery beyond the limit imposed by conventional seals. T.M.

N82-20184# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Turbine Engine Div.

A RETIREMENT-FOR-CAUSE STUDY OF AN ENGINE TURBINE DISK Final Report, 1975 - 1978

Richard J. Hill, Walter H. Reimann, and Jon S. Ogg Nov. 1981 35 p refs

(AF Proj. 3066)

(AD-A109724; AFWAL-TR-81-2094) Avail: NTIS HC A03/MF A01 CSCL 21/5

This report describes a procedure which allows for the retirement of turbine engine disks for actual life exhaustion rather than a statistical minimum limit of a population. The procedure is applied to the third stage turbine disk of the TF33 engine for demonstration purposes. The demonstration included detailed stress and fracture analysis in addition to actual spin pit testing. All spin pit testing was done by the Navy at the Naval Propulsion Center. The effort was a technical success but could not be implemented for the TF33 engine for logistic reasons.

Author (GRA)

N82-20185# Garrett Corp., Phoenix, Ariz. Pneumatic Systems Div.

DUALCHANNEL FUEL CONTROL PROGRAM, PHASE 2 Final Report, Apr. 1978 - Aug. 1980

John Itamoto Adelphi, Md. HDL Aug. 1981 81 p refs

(Contract N00019-78-G-0288)

(AD-A109715; Rept-41-2710A; HDL-CR-81-288-1) Avail: NTIS HC A05/MF A01 CSCL 21/5

This report presents the results of a program conducted by Garrett to investigate a dual-channel fuel control for gas turbine engines which could be used in military ground vehicles. The program presents a control system with requirements that are deemed necessary to provide a military gas turbine-powered vehicle with battlefield survivability and minimal restriction on the capability of completing the vehicle mission. This study showed that a parallel dissimilar technology backup control was the desirable approach and that fluidics was the ideal technology to perform this function due to its low cost, reliability, immunity to radiation, and ability to perform computation and logic commensurate with the requirements of achieving mission completion with no degradation in the vehicle's battlefield survivability. GRA

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N82-20186*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

A TRANSLATIONAL VELOCITY COMMAND SYSTEM FOR VTOL LOW SPEED FLIGHT

Vernon K. Merrick Mar. 1982 30 p refs

(NASA-TM-84215; A-8825; NAS 1.15:84215) Avail: NTIS HC A03/MF A01 CSCL 01C

A translational velocity flight controller, suitable for very low speed maneuvering, is described and its application to a large class of VTOL aircraft from jet lift to propeller driven types is analyzed. Estimates for the more critical lateral axis lead to the conclusion that the controller would provide a jet lift (high disk loading) VTOL aircraft with satisfactory 'hands off' station keeping in operational conditions more stringent than any specified in current or projected requirements. It also seems likely that ducted fan or propeller driven (low disk loading) VTOL aircraft would have acceptable hovering handling qualities even in high turbulence, although in these conditions pilot intervention to maintain satisfactory station keeping would probably be required for landing in restricted areas. Author

N82-20187*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

DESIGN CRITERIA FOR FLIGHTPATH AND AIRSPEED CONTROL FOR THE APPROACH AND LANDING OF STOL AIRCRAFT

James A. Franklin, Robert C. Innis, Gordon H. Hardy, and Jack D. Stephenson Mar. 1982 98 p refs

(NASA-TP-1911; NAS 1.60:1911; A-8645) Avail: NTIS HC A05/MF A01 CSCL 01C

A flight research program was conducted to assess requirements for flightpath and airspeed control for glide-slope tracking during a precision approach and for flare control, particularly as applied to powered-lift, short takeoff and landing (STOL) aircraft. Ames Research Center's Augmentor Wing Research Aircraft was used to fly approaches on a 7.5 deg glide slope to landings on a 30 X 518 m (100 X 1700 ft) STOL runway. The dominant aircraft response characteristics determined were flightpath overshoot, flightpath-airspeed coupling, and initial flightpath response time. The significant contribution to control of the landing flare using pitch attitude was the short-term flightpath response. The limiting condition for initial flightpath response time for flare control with thrust was also identified. It is possible to define flying-qualities design criteria for glide-slope and flare control based on the aforementioned response characteristics. M.D.K.

N82-20188*# National Aeronautics and Space Administration, Ames Research Center, Moffett Field, Calif.

SELF-TUNING REGULATORS FOR MULTICYCLIC CONTROL OF HELICOPTER VIBRATION

Wayne Johnson Mar. 1982 50 p refs

(NASA-TP-1996; NAS 1.60:1996; A-8719) Avail: NTIS HC A03/MF A01 CSCL 01C

A class of algorithms for the multicyclic control of helicopter vibration and loads is derived and discussed. This class is characterized by a linear, quasi-static, frequency-domain model of the helicopter response to control; identification of the helicopter model by least-squared-error or Kalman filter methods; and a minimum variance or quadratic performance function controller. Previous research on such controllers is reviewed. The derivations and discussions cover the helicopter model; the identification problem, including both off-line and on-line (recursive) algorithms; the control problem, including both open-loop and closed-loop

feedback; and the various regulator configurations possible within this class. Conclusions from analysis and numerical simulations of the regulators provide guidance in the design and selection of algorithms for further development, including wind tunnel and flight tests. M.G.

N82-20189# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
DEVELOPMENT OF LONGITUDINAL EQUIVALENT SYSTEM MODELS FOR SELECTED US NAVY TACTICAL AIRCRAFT Final Report, 1 Jan. 1980 - 1 Jul. 1981
David E. Bischoff 1 Aug. 1981 86 p refs
(WF41400000)
(AD-A109488; NADC-81069-60) Avail: NTIS HC A05/MF A01 CSCL 01/3

Frequency response matching techniques were applied to the longitudinal dynamics of five Navy tactical aircraft: the A-6, A-7, S-3, F-14 and F-18, to obtain equivalent system models of their short period response. The pitch rate transfer function was matched with a first order numerator over second order denominator equivalent system model. Freeing the numerator root (L Alpha) in the matching process resulted in large unrealistic values of the numerator term. The variation in L Alpha was reduced by simultaneously matching the pitch rate and normal acceleration transfer functions with the denominators constrained to be equal. The mismatch parameter associated with aircraft configurations which were not amenable to the first over second order equivalent models could be improved by identifying additional roots in the equivalent model. Correlation of the data with the requirements of MIL-F-8785C was straightforward for both short period damping ratio and time delay. Correlation of the frequency requirements, however, required that the control anticipation parameter definition be modified to represent the maximum rather than the initial pitch acceleration response.
Author (GRA)

N82-20190# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio. Structures and Dynamics Div.
CATEGORIZATION OF ATMOSPHERIC TURBULENCE IN TERMS OF AIRCRAFT RESPONSE FOR USE IN TURBULENCE REPORTS AND FORECASTS Final Report, Jan. 1979 - Feb. 1980
Elijah W. Turner, Jackie C. Sims, and Andy White Nov. 1981 146 p refs
(AF Proj. 7500)
(AD-A109585; AFWAL-TR-81-3058) Avail: NTIS HC A07/MF A01 CSCL 01/2

This report describes a method of calculating the gust sensitivity of conventional aircraft and presents gust sensitivity values for a total of 69 military and civilian aircraft. Gust sensitivity is presented in terms of the vertical load factor response of aircraft per foot per second discrete gust. The information is intended to permit organizations engaged in the forecasting of atmospheric turbulence to properly take into consideration the capability of particular aircraft to operate safely in various turbulence levels. The basis for calculating the gust sensitivity is the so called 'gust loads formula' which is a single degree of freedom mathematical model of the aircraft excited by a one-minus-cosine shaped wave form of 25 chord wave length. An empirical equation is used to calculate the aircraft normal force coefficient over the subsonic, transonic, and supersonic airspeed range.
Author (GRA)

N82-20191# Army Aviation Research and Development Command, St. Louis, Mo.
INTEGRATION OF CONTROLS AND DISPLAYS IN U.S. ARMY HELICOPTER COCKPITS
J. A. Dasaro and C. T. Elliott Nov. 1981 28 p refs
(AD-A109594; USAAVRADCOM-TR-81-E-4) Avail: NTIS HC A03/MF A01 CSCL 01/4

The U.S. Army has embarked on a digital avionic program with the immediate goal of developing an integrated avionic system which would eliminate all dedicated communication, navigation, and identification (CNI) control and display units (CDU's) from the cockpit. The CNI equipments were viewed as a well defined set whose control and display functions could be integrated at minimal risk. The integrated CDU developed can be used to in-service or developmental aircraft to alleviate space problems, reduce pilot workload, and increase CNI capability. A four-phase effort consisting of design, hardware fabrication, system integration, and testing was established. A cockpit was synthesized for the BLACK HAWK helicopter in which all crew functions were accomplished using multifunction interactive controls and displays. The results of this effort are presented, together with the status of the hardware currently in fabrication and the Army's plans for bench and flight testing. This exploratory effort is called the Army Digital Avionic System (ADAS). GRA

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space).*

N82-20192*# National Aeronautics and Space Administration, Washington, D. C.
SONIC WIND TUNNEL OF THE INSTITUTE OF FLUID MECHANICS OF LILLE
G. Gontier Mar. 1982 17 p refs Transl. into ENGLISH from La Recherche Aeronautique (France), no. 10, 1949 p 3-9 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76687; NAS 1.15:76687) Avail: NTIS HC A02/MF A01 CSCL 14E

A 65 hp wind tunnel with a 40 mm by 240 mm airstream is described. This wind tunnel can achieve speeds in the neighborhood of the speed of sound, both subsonic and supersonic. It is useful in studying the transonic bump technique. The test section is 600 mm long. The side walls are made of transparent glass, and both the upper and lower walls are deformable, each through the use of nine jacks with elastic sleeves. So as to avoid condensation, the airstream's temperature is stabilized by an air exchanger at the temperature of the outside air. The first results for supersonic operation, the distribution of Mach numbers within the airstream between the parallel walls, the value of the use factor, and the diffuser's efficiency are all given. B.W.

N82-20193# Sandia Labs., Albuquerque, N. Mex. Dept. of Engineering Science and Mechanics.
METHODS FOR ANALYSIS OF WIND RIPPLE IN WIND TURBINES
R. E. Akins Apr. 1981 59 p refs
(Contract DE-AC04-76-DP-00789)
(SAND-81-7006) Avail: NTIS HC A04/MF A01

Efficient and economical utilization of wind power requires the ability to measure and ultimately predict the effects fluctuations in the incident wind have on a wind turbine. In order to begin to quantitatively assess these effects, experimental techniques were developed to allow analysis of full-scale performance of wind turbines with particular emphasis on the effects caused by turbulence in the incident wind. R.J.F.

N82-20194# Textron Bell Helicopter, Fort Worth, Tex.
ROTORCRAFT FLIGHT SIMULATION COMPUTER PROGRAM C81 WITH DATAMAP INTERFACE. VOLUME 1: USER'S MANUAL Final Report, Jul. - Dec. 1979
James R. VanGaasbeek Ft. Eustis, Va. Army Research and Technology Lab. Oct. 1981 576 p refs
(Contract DAAK51-79-C-0015; DA Proj. 1L1-62209-AH-76)
(AD-A108246; BHT-699-099-111-Vol-1; USAAVRADCOM-TR-80-D-38A) Avail: NTIS HC A25/MF A01 CSCL 01/3

This report documents the current version in the C81 family of rotorcraft flight simulation programs developed by Bell Helicopter Textron. This current version of the digital computer program is referred to as AGAP80. The accompanying program for calculating fully-coupled rotor blade mode shapes is called DNAM05, and an associated rotor wake program is called AR9102. The AGAP80 version of C81 was developed by adding some analytical features to the AGAJ76 version, and including

the ability to generate Data Transfer Files for use by the File Creation Program of DATAMAP. The User's Manual, contains the detailed information necessary for setting up an input data deck and interpreting the computed data. GRA

N82-20195# Singer Co., Binghamton, N.Y. Link Div.
STUDY AND DESIGN OF HIGH G AUGMENTATION DEVICES FOR FLIGHT SIMULATORS Final Report
Gerald J. Kron, Frank M. Cardullo (MIT), and Laurence R. Young Wright-Patterson AFB, Ohio Air Force Human Resources Lab. Dec. 1981 548 p refs
(Contract F33615-77-C-0055; AF Proj. 6114)
(AD-A109127; AFHRL-TP-80-41) Avail: NTIS HC A23/MF A01 CSCL 06/19

The physiological effects of accelerated flight are considered to contain perceptual information important to vehicle control and contribute to defining flight envelopes accessible to the pilot. As such, these effects, or acceptable surrogates thereof, must be considered for inclusion within ground-based devices designed to train pilots for their flight mission. This study investigates the physiological effects of accelerated flight within the cardiovascular musculoskeletal, visual, auditory, tactile, and respiratory systems. The study advances conceptual designs of research-oriented devices thought capable of inducing, in the unaccelerated state, the perception of accelerated flight physiological effects. The authors conclude that one of the most important effects impacting vehicle control and successful mission execution is loss of visual acuity under accelerated flight conditions and propose a dual effect matrixed liquid crystal variable transparency visor to replicate this effect. A math model to simulate the effect is also presented. The study contains a bibliography of 277 references pertinent to accelerated flight physiological effects and equivalent simulation device design. The study presents an appendix containing an annotated bibliography of 133 references. Author (GRA)

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

N82-20196*# Science Applications, Inc., Schaumburg, Ill. Advanced Planning and Analysis Div.
COMPARATIVE COST ASSESSMENT OF PLANETARY MISSIONS
Nov. 1981 69 p refs Prepared for JPL
(Contract JPL-955630)
(NASA-CR-168654; NAS 1.26:168654) Avail: NTIS HC A04/MF A01 CSCL 22A

A study to explore the cost differences resulting from implementing a series of representative solar system exploration missions in either ballistic or low-thrust flight modes is presented. Cost comparisons of missions using a solar electric propulsion delivery systems with ballistic equivalent mission designs were made. The mission set, cost elements, and delivery modes are detailed. Objectives for each of the six mission sets including two asteroid missions, a comet mission, a Mercury mission, and two outer planet missions are given. M.D.K.

N82-20197*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RELATIVISTIC KINEMATICS FOR MOTION FASTER THAN LIGHT
R. T. Jones Feb. 1982 25 p refs
(NASA-TM-84214; A-8824; NAS 1.15:84214) Avail: NTIS HC A02/MF A01 CSCL 22A

The use of conformal coordinates in relativistic kinematics is illustrated and a simple extension of the theory of motions faster than light is provided. An object traveling at a speed greater than light discloses its presence by appearing suddenly at a point, splitting into two apparent objects which then recede from each other at sublight velocities. According to the present theory motion at speeds faster than light would not benefit a space traveler, since the twin paradox becomes inverted at such speeds. In Einstein's theory travel at the velocity of light in an intertial system is equivalent to infinite velocity for the traveler. In the present theory the converse is also true; travel at infinite velocity is equivalent to the velocity of light for the traveler. S.L.

N82-20198*# California Univ., Santa Barbara. Quantum Inst.
ANALYTICAL AND EXPERIMENTAL INVESTIGATION OF LIQUID DOUBLE DROP DYNAMICS: PRELIMINARY DESIGN FOR SPACE SHUTTLE EXPERIMENTS Final Report
31 Dec. 1981 28 p refs
(Grant NAG2-27; Contract NCC2-11)
(NASA-CR-168679; NAS 1.26:168679) Avail: NTIS HC A03/MF A01 CSCL 22A

The preliminary grant assessed the use of laboratory experiments for simulating low g liquid drop experiments in the space shuttle environment. Investigations were begun of appropriate immiscible liquid systems, design of experimental apparatus and analyses. The current grant continued these topics, completed construction and preliminary testing of the experimental apparatus, and performed experiments on single and compound liquid drops. A continuing assessment of laboratory capabilities, and the interests of project personnel and available collaborators, led to, after consultations with NASA personnel, a research emphasis specializing on compound drops consisting of hollow plastic or elastic spheroids filled with liquids. Author

N82-20199*# Boeing Aerospace Co., Seattle, Wash. Large Space Systems Group.
SPACE OPERATIONS CENTER SYSTEM ANALYSIS STUDY EXTENSION. VOLUME 1: EXECUTIVE SUMMARY Final Report, Jun. 1980 - Dec. 1981
Jan. 1982 94 p refs Prepared in cooperation with Hamilton Standard, Hartford, Conn., and Grumman Aerospace Corp., Bethpage, N.Y. 4 Vol.
(Contract NAS9-16151)
(NASA-CR-167555; NAS 1.26:167555; D180-26785-1) Avail: NTIS HC A05/MF A01 CSCL 22A

The analysis fo Space Operations Center (SOC) systems is summarized. Design considerations, configurations of the manned orbital space station, planned operational and research missions, and subsystem tradeoffs are considered. Integration into the space transportation system is discussed. A modular design concept permitting growth of the SOC as its functions are expanded is described. Additional considerations are special requirements for habitat modules, design modifications needed to operate in geosynchronous orbits, and use of the external tank for cryogenic propellant storage or as a pressurized hangar. A cost summary is presented. J.D.H.

N82-20200*# Boeing Aerospace Co., Seattle, Wash. Large Space Systems Group.
SPACE OPERATIONS CENTER SYSTEM ANALYSIS STUDY EXTENSION. VOLUME 2: PROGRAMMATICS AND COST Final Report, Jun. 1980 - Dec. 1981
Jan. 1982 66 p refs Prepared in cooperation with Hamilton Standard, Hartford, Conn., and Grumman Aerospace Corp., Bethpage, N. Y. 4 Vol.
(Contract NAS9-16151)
(NASA-CR-167556; NAS 1.26:167556; D180-26785-2) Avail: NTIS HC A04/MF A01 CSCL 22A

A summary of Space Operations Center (SOC) orbital space station costs, program options and program recommendations is presented. Program structure, hardware commonality, schedules and program phasing are considered. Program options are analyzed with respect to mission needs, design and technology options, and anticipated funding constraints. Design and system options are discussed. J.D.H.

N82-20201*# Boeing Aerospace Co., Seattle, Wash.
SPACE OPERATIONS CENTER SYSTEM ANALYSIS. VOLUME 3, BOOK 1: SOC SYSTEM DEFINITION REPORT, REVISION A Final Report, Jun. 1980 - Jan. 1982
Jan. 1982 325 p Prepared in cooperation with Hamilton Standard, Hartford, Conn., and Grumman Aerospace Corp., Bethpage, N. Y. 4 Vol.
(Contract NAS9-16151)
(NASA-CR-167559; NAS 1.26:167559; D180-26495-3) Avail: NTIS HC A14/MF A01 CSCL 22A

The Space Operations Center (SOC) orbital space station

program and its elements are described. A work breakdown structure is presented and elements for the habitat and service modules, docking tunnel and airlock modules defined. The basis for the element's design is given. Mass estimates for the elements are presented in the work breakdown structure. J.D.H.

N82-20202*# Boeing Aerospace Co., Seattle, Wash.
SPACE OPERATIONS CENTER SYSTEM ANALYSIS. VOLUME 3, BOOK 2: SOC SYSTEM DEFINITION REPORT, REVISION A Final Report, Jun. 1980 - Jan. 1982
Jan. 1982 204 p refs Prepared in cooperation with Hamilton Standard, Hartford, Conn., and Grumman Aerospace Corp., Bethpage, N. Y. 4 Vol.
(Contract NAS9-16151)
(NASA-CR-167560; NAS 1.26:167560; D180-26495-3-Rev-A) Avail: NTIS HC A10/MF A01 CSCL 22A

The Space Operations Center (SOC) orbital space station program operations are described. A work breakdown structure for the general purpose support equipment, construction and transportation support, and resupply and logistics support systems is given. The basis for the design of each element is presented, and a mass estimate for each element supplied. The SOC build-up operation, construction, flight support, and satellite servicing operations are described. Detailed programmatics and cost analysis are presented. J.D.H.

N82-20203*# Boeing Aerospace Co., Seattle, Wash.
SPACE OPERATIONS CENTER SYSTEM ANALYSIS STUDY EXTENSION. VOLUME 4, BOOK 1: SOC SYSTEM ANALYSIS REPORT Final Report, Jun. 1980 - Jan. 1982
Jan. 1982 331 p refs Prepared in cooperation with Hamilton Standard, Hartford Conn., and Grumman Aerospace Corp., Bethpage, N. Y. 4 Vol.
(Contract NAS9-16151)
(NASA-CR-167557; NAS 1.26:167557; D180-26785-4) Avail: NTIS HC A15/MF A01 CSCL 22A

The Space Operations Center (SOC) orbital space station missions are analyzed. Telecommunications missions, space science, Earth sensing, and space testing missions, research and applications missions, defense missions, and satellite servicing missions are modeled and mission needs discussed. The satellite servicing missions are analyzed in detail, including construction and servicing equipment requirements, mission needs and benefits, differential drag characteristics of co-orbiting satellites, and satellite servicing transportation requirements. J.D.H.

N82-20204*# Boeing Aerospace Co., Seattle, Wash.
SPACE OPERATIONS CENTER SYSTEM ANALYSIS STUDY EXTENSION. VOLUME 4, BOOK 2: SOC SYSTEM ANALYSIS REPORT Final Report, Jun. 1980 - Jan. 1982
Jan. 1982 400 p refs Prepared in cooperation with Hamilton Standard, Hartford, Conn., and Grumman Aerospace Corp., Bethpage, N. Y. 4 Vol.
(Contract NAS9-16151)
(NASA-CR-167558; NAS 1.26:167558; D180-26785-4) Avail: NTIS HC A17/MF A01 CSCL 22A

The Space Operations Center (SOC) orbital space station research missions integration, crew requirements, SOC operations, and configurations are analyzed. Potential research and applications missions and their requirements are described. The capabilities of SOC are compared with user requirements. The SOC/space shuttle and shuttle-derived vehicle flight support operations and SOC orbital operations are described. Module configurations and systems options, SOC/external tank configurations, and configurations for geostationary orbits are described. Crew and systems safety configurations are summarized. J.D.H.

N82-20205# Library of Congress, Washington, D. C. Reference Section.
MANNED SPACE FLIGHT
George D. Havas, comp. Dec. 1981 19 p refs
(TB-81-10; ISSN-0090-5232) Avail: NTIS HC A02/MF A01

A selected bibliography (approximately 75 citations) is presented on the development of manned space flight from its beginnings, through multi-manned crews, lunar landings, and orbiting space stations, to present-day recoverable and reusable spacecraft. A list of periodicals and bibliographic services is also included. R.J.F.

N82-20206*# Analytical Mechanics Associates, Inc., Hampton, Va.
AN EXTENDED BET FORMAT FOR La RC SHUTTLE EXPERIMENTS: DEFINITION AND DEVELOPMENT
J. T. Findlay, G. M. Kelly, and M. W. Henry Jun. 1981 24 p refs
(Contract NAS1-16087)
(NASA-CR-165882; NAS 1.26:165882; AMA-81-11) Avail: NTIS HC A02/MF A01 CSCL 22A

A program for shuttle post-flight data reduction is discussed. An extended Best Estimate Trajectory (BET) file was developed. The extended format results in some subtle changes to the header record. The major change is the addition of twenty-six words to each data record. These words include atmospheric related parameters, body axis rate and acceleration data, computed aerodynamic coefficients, and angular accelerations. These parameters were added to facilitate post-flight aerodynamic coefficient determinations as well as shuttle entry air data sensor analyses. Software (NEWBET) was developed to generate the extended BET file utilizing the previously defined ENTREE BET, a dynamic data file which may be either derived inertial measurement unit data or aerodynamic coefficient instrument package data, and some atmospheric information. B.W.

N82-20207*# Analytical Mechanics Associates, Inc., Hampton, Va.
INERTIAL MEASUREMENT UNIT PRE-PROCESSORS AND POST-FLIGHT STS-1 COMPARISONS
John T. Findlay and Judy G. McConnell Aug. 1981 90 p refs
(Contract NAS1-16087)
(NASA-CR-165883; NAS 1.26:165883; AMA-81-22) Avail: NTIS HC A05/MF A01 CSCL 22A

The flight results show that the relative tri-redundant Inertial Measurement Unit IMU performance throughout the entire entry flight was within the expected accuracy. Comparisons are presented which show differences in the accumulated sensed velocity changes as measured by the tri-redundant IMUs (in Mean Equator and Equinox of 1950.0), differences in the equivalent inertial Euler angles as measured with respect to the M50 system, and finally, preliminary instrument calibrations determined relative to the ensemble average measurement set. Also, differences in the derived body axes rates and accelerations are presented. Because of the excellent performance of the IMUs during the STS-1 entry, the selection as to which particular IMU would best serve as the dynamic data source for entry reconstruction is arbitrary. T.M.

N82-20208# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
SPACECRAFT POINTING AND POSITION CONTROL
Pieter Ph. vandenBroek, ed. and S. Z. Szirmay, ed. Nov. 1981 255 p refs
(AGARD-AG-260; ISBN-92-835-1408-4) Avail: NTIS HC A12/MF A01

Recent developments and state-of-the-art technologies were examined in the following areas: attitude control and instrument pointing, orbit determination and control, and flexible satellite control. Emphasis is placed on the stationkeeping of synchronous communication satellites and on satellite attitude control. Control moment devices are also discussed. For individual titles, see N82-20209 through N82-20222.

N82-20209# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
ATTITUDE CONTROL OF GEOSTATIONARY SATELLITES WITH DOUBLE GIMBALLED MOMENTUM WHEELS c15
G. Schulz and Th. Lange *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 25 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

Conventional control methods are generalized using state vector feedback design procedures. Alternatively, a decoupled control method using a nondiagonal inertia tensor was derived. These are confronted to modern control theory design method

with observer, where especially the insensitivy with respect to variants of the moments of inertia was demonstrated. Author

N82-20210# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
ANALYSIS AND EXPERIMENTAL VERIFICATION OF THE NUTATION OF A SATELLITE EQUIPPED WITH MAGNETIC BEARING MOMENTUM WHEELS **c15**
C. Rouyer (SNIAS, Les Mureaux, France), G. Heimbolt, and Th. Lange *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 19 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

The problem of the nutation divergence of a 3 axis stablized satellite equipped with hydrodynamic bearing momentum wheels is discussed. The magnetic bearing momentum wheels, having a relatively low transverse rigidity and dissipating energy in the rotor (due to eddy currents), are likely to present an inconvenience of the same nature, if not of the same magnitude. A physical explanation of the phenomenon is given. The results of tests carried out on an air-bearing table are presented and it is shown that phenomenon cannot be detected on a satellite of the INTELSAT size. T.M.

N82-20211# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AUTONOMOUS ATTITUDE DETERMINATION FROM STAR DATA FOR A DUAL-SPIN PLANETARY SPACECRAFT **c15**
Edward C. Wong and John Y. Lai *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 15 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

A batch mode process which identifies three reference stars within a rotor-mounted star scanner's field-of-view based on the criteria of intensity and geometry was established. The sequential mode which continuously tracks the reference stars provides star transit times and estimates of rotor's spin rate. A least-square estimator was formulated which sequentially determines the spacecraft attitude from sucessive star crossings by minimizing the error in the star and scanner slit normal orthogonality. This spacecraft attitude also provides intermittent updates for the gyro propagated inertial attitude of the despun science platform. Simulation results are presented, showing successful star identification and attitude convergence in the presence of nutation and star transit time uncertainty. T.M.

N82-20212# Societe Nationale Industrielle Aerospatiale, Cannes (France).
SOFA: SYSTEM D'ORIENTATION FINE D'ANTENNE (AN ANTENNA FIN POINTING) MECHANISM **c32**
Bernard Hubert and Pierre Brunet *In* AGARD Spacecraft and Position Control Nov. 1981 13 p (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

The SOFA system is particularly suited to the transmit-and-receive antennae of television satellites. It is one of the requisites for a radiofrequency type deviation detector. The major characteristic of this system is complete freedom from friction and wear-out, resulting in numerous advantages, such as outstanding precision, virtually endless service life, high simplicity and reliability. The sizing method is described and performances are analyzed. The results from analogue simulations are presented. A functional model of the electrical and mechanical parts were built and subjected to on-ground tests using a 2 axis platform simulating the spacecraft's motions. The results obtained are in keeping with the predictions and simulations. Various possible applications of the SOFA system are mentioned. T.M.

N82-20213# Aerospace Corp., Los Angeles, Calif.
FACTORIZATION METHODS FOR PRECISION SATELLITE ORBIT DETERMINATION **c13**
G. J. Bierman (Factorized Estimation Applications, Inc.), L. A. Campbell, and W. A. Feess *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 16 p refs (For primary document see N82-20208 11-12)
(Contract F04701-80-C-0081)
Avail: NTIS HC A12/MF A01

State-of-the-art square root information filtering and smoothing technology that is incorporated into the Aerospace TRACE orbital analysis program are presented. Topics include a pseudo-epoch state batch-sequential filter formulation, techniques for inclusion of Markov process noise models, a variable dimension filter structure that accommodates state vectors of large size, and inclusion of a GPS second-order Markov clock model within the framework of the square root information filter/smoother formulation.. Planned evaluation of filter/smoother performance in a GPS context is also discussed. The filter/smoother is to be used for post-flight orbit determination, covariance analysis, navigation system performance monitoring, and to generate reference 'best estimate' orbits. T.M.

N82-20214# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
GEOSTATIONARY COMMUNICATION SATELLITE CONTROL **c15**
L. Flook and J. J. Pocha *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 11 p (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

The requirements for the control of the position and attitude of geostationary communications satellites were examined and some of the principle system parameters and options available are outlined. A number of current systems are compared and the principal limitations of their performance are discussed. The overall communication system trends are indicated and the effect of these upon the design of both attitude and position control is indicated. Author

N82-20215# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
AUTONOMOUS STATION KEEPING OF GEOSTATIONARY SATELLITES **c15**
M. C. Eckstein and A. Leibold *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 28 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

The increasing ground operational complexity of controlling the orbits of future 3 axis stabilized geostationary satellites, introduced by more stringent station keeping accuracy requirements over long mission times, suggests the consideration of autonomous orbit control. A self contained onboard navigation system consisting of an Earth sensor, several Sun sensors, a Polaris sensor and an onboard clock was investigated. An epoxy element filter along with a reasonably simple orbit model was used to evaluate the navigational information from the sensor data. The orbit corrections were performed by low thrust electric propulsion according to an optimal strategy. The feasibility and performance of the autonomous system is demonstrated by computer simulation of a one year station keeping period for a large 1000 kg geostationary satellite at 19 deg west. All computations relevant to the station keeping system were carried out in single precision in order to simulate the reduced onboard processor capacity. Author

N82-20216# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
DIGITAL ATTITUDE AND ORBIT CONTROL ELECTRONICS FOR LONG-LIFE COMMUNICATION SATELLITES **c33**
Michael Wlaka *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 7 p refs Sponsored in part by DFVLR-BPT (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

A modular cost and time efficient data processing system which has found several applications in space projects such as the Spacelab Instrument Pointing System (IPS) and the Microwave Remote Sensing Experiment (MRSE) is described. The requirement for performing complicated control algorithms for attitude and orbit control (AOC) and the desire to use standardized on-board electronics led to the development of the modular, microprocessor based data handling system which consists of a 16 bit-processor, a memory block, and various input/output modules and has the following special features: low weight; small volume; and low power consumption achieved by using multilayer boards and flat-pack CMOS chips. The stringent reliability requirements for long-life satellies led to a high degree of redundancy and

cross-strapping capability within the system. The described on-board data processing system provides the possibility of writing programs in PEARL which is idealy suited for realtime applications in the field of automatic attitude control. M.D.K.

N82-20217# Martin Marietta Aerospace, Denver, Colo.
INTEGRATED ORBIT/ATTITUDE DETERMINATION **c17**
A. Dale Mikelson *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 13 p (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

The Space Sextant - Autonomous Navigation Attitude Reference System (SS-ANARS), a spacecraft subsystem that has the integrated capability of on-board orbit determination with on-board attitude determination is described. The Space Sextant is a gimballed-two telescope included angle measurement device that is driven by an on-board computer to measure the angles between celestial bodies, as seen from a spacecraft, to an accuracy of 1 arc second. Orbit determination with the system is achieved by measuring the included angles between brighter stars and the limbs of the Moon and Earth, and processing these angle measurements through a Kalman filter with an on-board digital computer. Spacecraft position accuracy from 800 to 1200 feet is determined for any Earth orbit. Attitude determination relative to the celestial sphere is determined with the same device to an accuracy of less than 1 arc second by measuring the included angles between the brighter stars and a reference platform consisting of a mirror and a Porro prism. The SS-ANARS described has progressed through critical technology development, a proof of concept model, a laboratory model, and a flight demonstration system. This flight demonstration system is to be flown as a sortie payload on the Space Transportation System (Space Shuttle) to prove its autonomous-integrated orbit and attitude determination capabilities. M.D.K.

N82-20218*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A MULTILEVEL CONTROL APPROACH FOR A MODULAR STRUCTURED SPACE PLATFORM **c14**
F. D. Chichester (Bendix Corp., Teterboro, N.J.) and M. T. Borelli *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 10 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01 CSCL 22B

A three axis mathematical representation of a modular assembled space platform consisting of interconnected discrete masses, including a deployable truss module, was derived for digital computer simulation. The platform attitude control system as developed to provide multilevel control utilizing the Gauss-Seidel second level formulation along with an extended form of linear quadratic regulator techniques. The objectives of the multilevel control are to decouple the space platform's spatial axes and to accommodate the modification of the platform's configuration for each of the decoupled axes. Author

N82-20219# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
DYNAMIC CONTROL OF LARGE SPACECRAFT: A SURVEY OF TECHNIQUES **c18**
R. C. Rogers and M. Burton *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 11 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

A number of techniques for the dynamic control of large spacecraft are discussed. The main problems identified are the high order of the system and model accuracy. One basic approach to design a controller for a low order model obtained by truncating modes from the system model is discussed. This may lead to instability problems due to interaction with unmodelled modes. A number of techniques are discussed which aim to avoid or overcome these problems. An alternative approach to controller design aims at ensuring stability in the presence of modelling errors and truncated modes. In the simplest case this involves direct output feedback. A technique which enables a dynamic approach to be used is also discussed although it uses rate measurement and can therefore only be applied to vibration control. A brief comparison of the various control approaches applied to the control of a large platform is presented. Author

N82-20220# Lockheed Missiles and Space Co., Palo Alto, Calif.
MODELING, CONTROL AND SYSTEM IDENTIFICATION METHODS FOR FLEXIBLE STRUCTURES **c18**
N. K. Gupta (Integrated Systems, Inc., Palo Alto, Calif.), M. G. Lyons (Integrated Systems, Inc., Palo Alto, Calif.), J-N. Aubrun, and G. Margulies *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 41 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

Modeling, control design and system identification techniques to synthesize feedback control laws for large space structures are discussed. The theoretical background is covered. Techniques are applied to a mathematical model with complexity comparable to that of real flexible spacecraft. A tutorial description of the problem and summary of recent developments is included. The discussion is oriented towards the control design engineer. Author

N82-20221*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CONTROL OF LARGE SPACE STRUCTURES USING ANNUAL MOMENTUM CONTROL DEVICES (AMCD'S) **c18**
S. M. Joshi *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 12 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01 CSCL 22B

A controller design approach for large space structures, which proposes the use of several Annular Momentum Control Devices (AMCD's) for structural damping enhancement, and either torque actuators of AMCD's for primary attitude control, was investigated. The damping enhancement controller makes the system asymptotically stable under certain relatively simple conditions. The closed-loop stability of the system with the primary attitude controller as well as the overall controller was established. It is shown that the same AMCD's can be used for the actuation of the damping enhancement controller and the primary attitude controller. Numerical results were obtained for a finite-element model of a large, thin, completely free, flat aluminum plate. Author

N82-20222# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
MODERN SIMULATION TECHNIQUES IN SPACECRAFT DYNAMICS **c14**
R. Stapf, G. Heimbold, and J. Puls *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 27 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

For investigation of the dynamic behavior of spacecraft systems, simulations are commonly used in nearly every phase of a mission. Three hardware simulation methods are presented: a pure physical simulation method, which makes extensive use of scaling techniques in order to overcome technical and environmental difficulties is demonstrated by means of two examples; a hybrid simulation technique is presented, which allows to include the dynamic behavior of flexible appendages into a physical simulation; and finally, the possibility of implicating satellite hardware in a computer simulation by use of a three axes flight simulator is pointed out. M.D.K.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N82-20213# Aerospace Corp., Los Angeles, Calif.
FACTORIZATION METHODS FOR PRECISION SATELLITE ORBIT DETERMINATION
G. J. Bierman (Factorized Estimation Applications, Inc.), L. A. Campbell, and W. A. Feess *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 16 p refs (For primary document see N82-20208 11-12)
(Contract F04701-80-C-0081)
Avail: NTIS HC A12/MF A01

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N82-20223# TRW Defense and Space Systems Group, Albuquerque, N. Mex.
SXTF FACILITY DESIGN AND DEVELOPMENT SUPPORT Final Report, 1 Jan. 1980 - 27 Feb. 1981
E. P. Chivington, H. N. Hodges, and J. T. Nolan 28 May 1981 155 p refs
(Contract DNA001-79-C-0134)
(AD-A109389; TRW-34670-6009-UT-00; DNA-5642F) Avail: NTIS HC A08/MF A01 CSCL 14/2

This document summarizes the effort over the reporting period. The results of site surveys of NASA Houston and Arnold Engineering Development Center are summarized. A study of the possibility of including additional weapons effects testing in the SXTF design is included. A facility-user interface requirements document has been developed and is included. It specifies all of the support required by a satellite manufacturer in order to perform X-ray testing. Author (GRA)

N82-20218*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
A MULTILEVEL CONTROL APPROACH FOR A MODULAR STRUCTURED SPACE PLATFORM
F. D. Chichester (Bendix Corp., Teterboro, N.J.) and M. T. Borelli *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 10 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01 CSCL 22B

N82-20222# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
MODERN SIMULATION TECHNIQUES IN SPACECRAFT DYNAMICS
R. Stapf, G. Heimbold, and J. Puls *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 27 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N82-20224*# Science Applications, Inc., Irvine, Calif. Materials Sciences Operation.
INTEGRAL THROAT ENTRANCE DEVELOPMENT, QUALIFICATION AND PRODUCTION FOR THE ANTARES 3 NOZZLE Technical Report, Feb. 1977 - Oct. 1980
F. I. Clayton, R. B. Dirling, D. A. Eitman, and W. C. Loomis Jan. 1982 228 p refs
(Contract NAS1-15650)
(NASA-CR-165838; NAS 1.26:165838) Avail: NTIS HC A11/MF A01 CSCL 20H

Although design analyses of a G-90 graphite integral throat entrance for the Antares 3 solid rocket motor nozzle indicated acceptable margins of safety, the nozzle throat insert suffered a thermostructural failure during the first development firing. Subsequent re-analysis using properties measured on material from the same billet as the nozzle throat insert showed negative margins. Carbon-carbon was investigated and found to result in large positive margins of safety. The G-90 graphite was replaced by SAI fast processed 4-D material which uses Hercules HM 10000 fiber as the reinforcement. Its construction allows powder filling of the interstices after preform fabrication which accelerates the densification process. Allied 15V coal tar pitch is then used to complete densification. The properties were extensively characterized on this material and six nozzles were subjected to demonstration, development and qualification firings. A.R.H.

N82-20225*# National Aeronautics and Space Administration, Washington, D. C.
ORBITING QUARANTINE FACILITY. THE ANTAEUS REPORT
Donald L. DeVincenzi, ed. and John R. Bagby, ed. (Colorado State Univ.) 1981 144 p refs
(NASA-SP-454; NAS 1.21:454; LC-81-600179) Avail: NTIS HC A07/MF A01 CSCL 22B

A mission plan for the Orbiting Quarantine Facility (OQF) is presented. Coverage includes system overview, quarantine and protocol, the laboratory, support systems, cost analysis and possible additional uses of the OQF. For individual titles, see N82-20226 through N82-20232.

N82-20226*# National Aeronautics and Space Administration, Washington, D. C.
ORBITING QUARANTINE FACILITY. THE ANTAEUS REPORT, SUMMARY
In its Orbiting Quarantine Facility 1981 p 1-6 (For primary document see N82-20225 11-15)
Avail: NTIS HC A07/MF A01 CSCL 22B

Requirements for handling extraterrestrial samples in an orbiting quarantine facility are examined. The major concepts and findings of the study are outlined. One approach that could be taken for receiving, containing, and analyzing samples returned from the surface of Mars in a mission analogous to the lunar return missions of the late 1960s and early 1970s is described. It constructs a general mission scenario and presents an overall systems design, including an approach to cost assessment. Particular attention is paid to the design of system hardware components and to the elaboration of an experimental protocol. N.W.

N82-20227*# National Aeronautics and Space Administration, Washington, D. C.
MISSION PERSPECTIVES
In its Orbiting Quarantine Facility 1981 p 7-18 refs (For primary document see N82-20225 11-15)
Avail: NTIS HC A07/MF A01 CSCL 22B

Handling the Martian samples by requiring that they be subjected to a complex protocol designed to detect life, which, if present, will then be assessed for its effects on terrestrial life forms is addressed. Sample testing must be performed within facilities that ensure that such Martian organisms cannot be accidentally introduced to Earth's biosphere during the assessment process. An Orbiting Quarantine Facility (OQF) designed to permit the detection and characterization of Martian life forms, while affording the Earth and its inhabitants the maximum level of protection, is analyzed and described. N.W.

N82-20228*# National Aeronautics and Space Administration, Washington, D. C.
SYSTEMS OVERVIEW AND DESIGN METHODOLOGY
In its Orbiting Quarantine Facility 1981 p 19-35 refs (For primary document see N82-20225 11-15)
Avail: NTIS HC A07/MF A01 CSCL 22B

The mission hardware to support a quarantine procedure for a proposed unmanned Mars sample return mission is described. There are several current options for acquiring a sample from the surface of Mars, ranging from a 'grab-and-run', or undocumented, sample return to a fully documented, selected-site, multisample mission. Although the Orbiting Quarantine Facility conceived was designed for one of the more likely mission plans (a documented collection of many subsamples), the facility is suitable for quarantine testing of the sample regardless of how it is acquired on Mars. N.W.

N82-20229*# National Aeronautics and Space Administration, Washington, D. C.
QUARANTINE AND PROTOCOL
In its Orbiting Quarantine Facility 1981 p 37-86 refs (For primary document see N82-20225 11-15)
Avail: NTIS HC A07/MF A01 CSCL 22B

The purpose of the Orbiting Quarantine Facility is to provide maximum protection of the terrestrial biosphere by ensuring that the returned Martian samples are safe to bring to Earth. The protocol designed to detect the presence of biologically active agents in the Martian soil is described. The protocol determines one of two things about the sample: (1) that it is free from nonterrestrial life forms and can be sent to a terrestrial containment facility where extensive chemical, biochemical, geological, and physical investigations can be conducted; or (2) that it exhibits 'biological effects' of the type that dictate second order testing. The quarantine protocol is designed to be conducted on a small portion of the returned sample, leaving the bulk of the sample undisturbed for study on Earth. N.W.

N82-20230*# National Aeronautics and Space Administration, Washington, D. C.
THE LABORATORY MODULE
In its Orbiting Quarantine Facility 1981 p 87-106 refs (For primary document see N82-20225 11-15)
Avail: NTIS HC A07/MF A01 CSCL 22B

Of the five modules comprising the Orbiting Quarantine Facility, the Laboratory Module must provide not only an extensive research capability to permit execution of the protocol, but also the flexibility to accommodate second-order testing if nonterrestrial life is discovered in the sample. The biocontainment barriers that protect the sample and the researchers from cross contamination are described. Specifically, the laboratory layout, laboratory equipment, the environmental control and life support system, and containment assurance procedures are discussed. The metal manipulation arm proposed for use within the biocontainment cabinets is described. Sample receipt and processing procedures are outlined. N.W.

N82-20231*# National Aeronautics and Space Administration, Washington, D. C.
SUPPORT SYSTEMS OF THE ORBITING QUARANTINE FACILITY
In its Orbiting Quarantine Facility 1981 p 107-126 refs (For primary document see N82-20225 11-15)
Avail: NTIS HC A07/MF A01 CSCL 22B

The physical support systems, the personnel management structure, and the contingency systems necessary to permit the Orbiting Quarantine Facility (OQF) to function as an integrated system are described. The interactions between the subsystems within the preassembled modules are illustrated. The Power Module generates and distributes electrical power throughout each of the four modules, stabilizes the OQF's attitude, and dissipates heat generated throughout the system. The Habitation Module is a multifunctional structure designed to monitor and control all aspects of the system's activities. The Logistics Module stores the supplies needed for 30 days of operation and provides storage for waste materials generated during the mission. The Laboratory Module contains the equipment necessary for executing the protocol, as well as an independent life support system. N.W.

N82-20232*# National Aeronautics and Space Administration, Washington, D. C.
ADDITIONAL USES OF THE FACILITY
In its Orbiting Quarantine Facility 1981 p 127-134 refs (For primary document see N82-20225 11-15)
Avail: NTIS HC A07/MF A01 CSCL 22B

The adaptability and utility of the Orbiting Quarantine Facility (OQF) for purposes other than the quarantine mission are considered. One option in the quarantine testing protocol calls for performing a long-term, complete study of the Martian sample in space, rather than releasing the sample to an Earth-based laboratory. It is also possible that the studies prescribed in the protocol will not detect any life forms, in which case the mission will be completed as early as 60 to 90 days from the initial receipt of the Martian sample. It is because of this latter possibility that options for other uses of the facility were considered. N.W.

N82-20233# General Electric Co., Philadelphia, Pa. Reentry Systems Div.
PROCESSING RESEARCH ON CHEMICALLY VAPOR DEPOSITED SILICON NITRIDE Final Technical Report, 1 Jan. 1980 - 31 Oct. 1981
R. A. Tanzilli, J. J. Gebhardt, and J. DAndrea Dec. 1981 129 p refs
(Contract N00014-80-C-0575; NR Proj. 032-603)
(AD-A109204; Rept-81SDR2111) Avail: NTIS HC A07/MF A01 CSCL 17/5

The feasibility of preparing free standing plate and hemispherical domes of crystalline silicon nitride by the chemical vapor deposition (CVD) technique has been established as a result of processing research conducted on this program. Physical property characterizations of a wide range of deposits have established the CVD form of silicon nitride as a candidate electromagnetic (EM) window material for advanced, high-performance tactical missile systems. The EM absorption coefficients of CVD silicon nitride in the UV-IR and radar transmittance passbands are far superior to the more conventional silicon nitride modifications (i.e. HPSN and RSSN). At the current stage of process development, the flexure strength is comparable to RSSN exhibiting similar strength retention properties at elevated temperatures. Average room temperature flexure strength levels of 317 MN/sq m (46,000 psi) were achieved by codeposition with minor amounts of aluminum chloride during this program (Phase 3); this level represents a 150 percent increase in strength compared to levels achieved during the initial Phase 1 program. With a better understood deposition model now in hand, as a result of the Phase 3 program, a high probability exists in future process optimization studies for achieving additional improvements in the mechanical and optical properties of CVD alpha-silicon nitride. GRA

N82-20209# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
ATTITUDE CONTROL OF GEOSTATIONARY SATELLITES WITH DOUBLE GIMBALLED MOMENTUM WHEELS
G. Schulz and Th. Lange *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 25 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

N82-20210# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
ANALYSIS AND EXPERIMENTAL VERIFICATION OF THE NUTATION OF A SATELLITE EQUIPPED WITH MAGNETIC BEARING MOMENTUM WHEELS
C. Rouyer (SNIAS, Les Mureaux, France), G. Heimbolt, and Th. Lange *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 19 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

N82-20211# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AUTONOMOUS ATTITUDE DETERMINATION FROM STAR DATA FOR A DUAL-SPIN PLANETARY SPACECRAFT
Edward C. Wong and John Y. Lai *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 15 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

N82-20214# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
GEOSTATIONARY COMMUNICATION SATELLITE CONTROL
L. Flook and J. J. Pocha *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 11 p (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

N82-20215# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
AUTONOMOUS STATION KEEPING OF GEOSTATIONARY SATELLITES
M. C. Eckstein and A. Leibold *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 28 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N82-20234*# National Aeronautics and Space Administration, Washington, D. C.
OSS-1 PRELAUNCH MISSION OPERATION REPORT
1982 31 p
(NASA-TM-84156; E-835-03-82-01; NAS 1.15:84156) Avail: NTIS HC A03/MF A01 CSCL 22A

Because the primary objective of the STS-3 flight requires the Orbiter to point its bay at the Sun for extended periods of time to test its thermal characteristics, experiments selected for the OSS-1 payload emphasize solar physics and thermodynamic technology. However, they also address space plasma physics, astronomy, planetology, and life science. The sequence and operations of the third shuttle flight are described as well as the nine instruments and the power, command, data, and cooling systems required to support the experiments. Objectives of the investigations are to study plant growth; diagnose space plasmas; determine the electrical charging properties of the orbiter; measure the optical properties of the orbiter induced atmosphere; test the capability of heart pipe temperature control system; observe the Sun and measure the degree of X-ray polarization in the event of solar flares; monitor the accelerated mass of molecular contaminants during the mission; and measure the micrometeorite flow using a passive sensor (microabradion foil). A.R.H.

N82-20235*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE SHUTTLE STS-1 SRB DAMAGE INVESTIGATION
Clyde D. Nevins Jan. 1982 53 p refs
(NASA-TM-82461; NAS 1.15:82461) Avail: NTIS HC A04/MF A01 CSCL 22B

The physical damage incurred by the solid rocket boosters during reentry on the initial space shuttle flight raised the question of whether the hardware, as designed, would yield the low cost per flight desired. The damage was quantified, the cause determined and specific design changes recommended which would preclude recurrence. Flight data, postflight analyses, and laboratory hardware examinations were used. The resultant findings pointed to two principal causes: failure of the aft skirt thermal curtain at the onset of reentry aerodynamic heating, and overloading of the aft shirt stiffening rings during water impact. Design changes were recommended on both the thermal curtain and the aft skirt structural members to prevent similar damage on future missions. S.L.

N82-20236*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SENSITIVITY ANALYSIS OF THE SPACE SHUTTLE TO ASCENT WIND PROFILES
Orvel E. Smith and Lambert D. Austin, Jr. Mar. 1982 21 p refs
(NASA-TP-1988; M-374; NAS 1.60:1988) Avail: NTIS HC A02/MF A01 CSCL 22B

A parametric sensitivity analysis of the space shuttle ascent flight to the wind profile is presented. Engineering systems parameters are obtained by flight simulations using wind profile models and samples of detailed (Jimsphere) wind profile measurements. The wind models used are the synthetic vector wind model, with and without the design gust, and a model of the vector wind change with respect to time. From these comparison analyses an insight is gained on the contribution of winds to ascent suosystems flight parameters. R.J.F.

N82-20237*# Calspan Field Services, Inc., Arnold Air Force Station, Tenn.
WIND TUNNEL TESTS OF THE SPACE SHUTTLE FOAM INSULATION WITH SIMULATED DEBONDED REGIONS, ADDENDUM
L. A. Ticatch, Nutt, K. W. Sep. 1981 22 p Prepared for Marietta Corp., New Orleans
(NASA-CR-168511; AD-A109567; AEDC-TSR-81-V13-ADD; NAS 1.26:168511) Avail: NTIS HC A02/MF A01 CSCL 22/2

Wind tunnel tests of the Space Shuttle External Tank Foam insulation, with simulated lightning protectors, were conducted in the von Karman Gas Dynamics Facility Tunnel C. The tests were conducted to examine three lightning conductive coating materials for debris production potential in simulated convective heating environments. The material samples were tested using the wedge technique. The tests were run at a free-stream Mach number 10 and a free stream total temperature of 1,900 R. The wedge angle was varied to provide test conditions which were representative of those expected during launch.
Author (GRA)

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N82-20217# Martin Marietta Aerospace, Denver, Colo.
INTEGRATED ORBIT/ATTITUDE DETERMINATION
A. Dale Mikelson *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 13 p (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-20238*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
APPLICATION OF A COMPUTERIZED VIBROACOUSTIC DATA BANK FOR RANDOM VIBRATION CRITERIA DEVELOPMENT
Robin C. Ferebee Mar. 1982 32 p refs
(NASA-TP-1998; NAS 1.60:1998; M-376) Avail: NTIS HC A03/MF A01 CSCL 09B

A computerized data bank system was developed for utilization of large amounts of vibration and acoustic data to formulate component random vibration design and test criteria. This system consists of a computer, graphics tablets, and a dry silver hard copier which are all desk top type hardware and occupy minimal space. Currently, the data bank contains data from the Saturn 5 and Titan 3 flight and static test programs. The vibration and acoustic data are stored in the form of power spectral density and one third octave band plots over the frequency range from 20 to 2000 Hz. The data were stored by digitizing each spectral plot by tracing with the graphics tablet. The digitized data were statistically analyzed, and the resulting 97.5 percent confidence levels were stored on tape along with the appropriate structural parameters. Standard extrapolation procedures were programmed for prediction of component random vibration test criteria for new launch vehicle and payload configurations. A user's manual is included to guide potential users through the programs.
Author

N82-20239# Draper (Charles Stark) Lab., Inc., Cambridge, Mass.
ACOSS SIX (ACTIVE CONTROL OF SPACE STRUCTURES) Final Technical Report, 14 Feb. 1980 - 13 Feb. 1981
Robert Strunce, Kiguan G. Lin, Daniel R. Hegg, Eli Fogel, James D. Turner, R. K. Pearson, G. J. Kissel, H. M. Chun, and N. H.

McClanroch Griffiss AFB, N.Y. RADC Oct. 1981 206 p refs
(Contract F30602-80-C-0096; AF Proj. C654; ARPA Order 3654)
(AD-A108910; R-1454; RADC-TR-81-289) Avail: NTIS HC A10/MF A01 CSCL 22/2

The research documented in this report addresses several major technical issues in vibration controller design methodologies that are of fundamental importance to control of large flexible space structures. Fundamentally important analytical and numerical results, as well as useful new insights, have been obtained on: optimality of fixed-form reduced-order compensators; full-order closed-loop stability and robustness with reduced-order controllers; prevention of control and observation spillover; active augmentation of damping, stiffness, and stability, stabilizability by output feedback control; large-angle maneuver with simultaneous vibration suppression; and possibilities for improving current controller design methodologies. GRA

N82-20219# British Aerospace Dynamics Group, Stevenage (England). Space and Communications Div.
DYNAMIC CONTROL OF LARGE SPACECRAFT: A SURVEY OF TECHNIQUES
R. C. Rogers and M. Burton *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 11 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

N82-20220# Lockheed Missiles and Space Co., Palo Alto, Calif.
MODELING, CONTROL AND SYSTEM IDENTIFICATION METHODS FOR FLEXIBLE STRUCTURES
N. K. Gupta (Integrated Systems, Inc., Palo Alto, Calif.), M. G. Lyons (Integrated Systems, Inc., Palo Alto, Calif.), J-N. Aubrun, and G. Margulies *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 41 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

N82-20221*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CONTROL OF LARGE SPACE STRUCTURES USING ANNUAL MOMENTUM CONTROL DEVICES (AMCD'S)
S. M. Joshi *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 12 p refs (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01 CSCL 22B

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

No abstracts in this category.

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels*, and *44 Energy Production and Conversion*.

N82-20240*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
GEOMETRY AND STARVATION EFFECTS IN HYDRODYNAMIC LUBRICATION
David E. Brewe and Bernard J. Hamrock 1982 18 p refs Proposed for presentation at the 59th Meeting of the Propulsion and Energetics Panel Symp. on Problems in Bearings and Lubrication, Ottawa, Canada, 31 May - 3 Jun. 1982; sponsored by AGARD Prepared jointly with Army Aviation Research and Development Command, St. Louis
(NASA-TM-82807; E-1147; NAS 1.15:82807; AVRADCOM-TR-82-C-17) Avail: NTIS HC A02/MF A01 CSCL 20D

Numerical methods were used to determine the effects of lubricant starvation on the minimum film thickness under conditions of a hydrodynamic point contact. Starvation was effected by varying the fluid inlet level. The Reynolds boundary conditions were applied at the cavitation boundary and zero pressure was stipulated at the meniscus or inlet boundary. A minimum-film-thickness equation as a function of both the ratio of dimensionless load to dimensionless speed and inlet supply level was determined. By comparing the film generated under the starved inlet condition with the film generated from the fully flooded inlet, an expression for the film reduction factor was obtained. Based on this factor a starvation threshold was defined as well as a critically starved inlet. The changes in the inlet pressure buildup due to changing the available lubricant supply are presented in the form of three dimensional isometric plots and also in the form of contour plots. Author

N82-20241*# Princeton Univ., N. J.
EXTENSIONS TO ANALYSIS OF IGNITION TRANSIENTS OF SEGMENTED ROCKET MOTORS Final Report
Leonard H. Caveny 6 Jan. 1978 38 p refs
(NASA Order H-30539B)
(NASA-CR-150632; NAS 1.26:150632) Avail: NTIS HC A03/MF A01 CSCL 21H

The analytical procedures described in NASA CR-150162 were extended for the purpose of analyzing the data from the first static test of the Solid Rocket Booster for the Space Shuttle. The component of thrust associated with the rapid changes in the internal flow field was calculated. This dynamic thrust component was shown to be prominent during flame spreading. An approach was implemented to account for the close coupling between the igniter and head end segment of the booster. The tips of the star points were ignited first, followed by radial and longitudinal flame spreading. Author

N82-20242*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
ADVANCED SPACE PROPULSION THRUSTER RESEARCH Annual Progress Report, 1 Dec. 1980 - 1 Dec. 1981
Paul J. Wilbur Dec. 1981 150 p refs
(Grant NGR-06-002-112)
(NASA-CR-165584; NAS 1.26:165584) Avail: NTIS HC A07/MF A01 CSCL 21H

Experiments showed that stray magnetic fields can adversely affect the capacity of a hollow cathode neutralizer to couple to an ion beam. Magnetic field strength at the neutralizer cathode orifice is a crucial factor influencing the coupling voltage. The effects of electrostatic accelerator grid aperture diameters on the ion current extraction capabilities were examined experimentally to describe the divergence, deflection, and current extraction capabilities of grids with the screen and accelerator apertures displaced relative to one another. Experiments performed in orificed, mercury hollow cathodes support the model of field enhanced thermionic electron mission from cathode inserts. Tests supported the validity of a thermal model of the cathode insert. A theoretical justification of a Saha equation model relating cathode plasma properties is presented. Experiments suggest that ion loss rates to discharge chamber walls can be controlled. A series of new discharge chamber magnetic field configurations were generated in the flexible magnetic field thruster and their effect on performance was examined. A technique used in the thruster to measure ion currents to discharge chamber walls is described. Using these ion currents the fraction of ions produced that are extracted from the discharge chamber and the energy cost of plasma ions are computed. M.D.K.

N82-20243*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Chemical Propulsion Information Agency.
JANNAF HANDBOOK. ROCKET EXHAUST PLUME TECHNOLOGY. CHAPTER 5: BASE FLOW
R. L. Bender (REMTEC, Inc., Huntsville, Ala.) Jul. 1981 579 p

refs Sponsored by NASA. Marshall Space Flight Center
(Contract N00024-81-C-5301)
(NASA-CR-168501; NAS 1.26:168501; AD-A103846; CPIA-Pub-263-CH-5) Avail: NTIS HC A25/MF A01 CSCL 21H

Methods and procedures which describe base flow fields and plume induced base region thermal environments are presented. Utilization of the various computational and predictive methods for missile, launch vehicle, and spacecraft problems is emphasized. The base flow predictive methods are organized and presented according to base configuration; i.e., - the number and arrangement of engines. A continuity of development is maintained from simple procedures for simple geometries to complex procedures for simple geometries to complex procedures for complex geometries. For a given configuration, the techniques are further separated according to flight regime or approach flow, and, if necessary, are separated again according to chemical propulsive system. Within each category, methods are presented to determine base pressure, base heating environments, and local flow field properties. S.L.

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

No abstracts in this category.

24 COMPOSITE MATERIALS

Includes laminates.

N82-20244 State Univ. of New York at Stony Brook.
EFFECTS OF ELECTRIC FIELD AND AMBIENT ENVIRONMENTS ON SLOW CRACK GROWTH IN SODA-LIME SILICA GLASS AND SINGLE CRYSTAL SILICON Ph.D. Thesis
Sarit Behari Bhaduri 1981 205 p
Avail: Univ. Microfilms Order No. 8127107

Slow crack growth in soda-lime silica glass (almost isotropic and transparent) and in single crystal silicon (anisotropic and opaque) was studied using a double torsion (DT) test in load relaxation mode. From characterization experiments on DT specimens, the useful crack length range was determined to be 1/3 and 2/3 of the sample length and the mode of fracture was of type I. All the three regions (I, II and III) of crack growth was present in glass under ambient air, water, and with electric field. The experimental data were fitted to Brown's generalized crack growth theory to obtain other intrinsic quantities such as Helmoltz free energy and activation volume for different regions of crack growth. In silicon, region III crack growth behavior was observed with ambient air and water. With etchant and electric field (10 to 50 V), regions III and II were observed. Usual data fit to Brown's model yielded values of Helmoltz free energy and activation volume. It was also determined that the above force did not affect region III behavior. Dissert. Abstr.

N82-20245 Alfred Univ., N.Y.
COMPACTION STUDY OF SPRAY-DRIED ALUMINA AGGLOMERATES Ph.D. Thesis
Robert Anthony DiMilia 1981 137 p
Avail: Univ. Microfilms Order No. 8125517

Spray dried alumina agglomerates of varying initial particle size and agglomerate character were compacted in a cylindrical metal die under constant strain rate conditions. The binder phase of the agglomerates was polyvinyl alcohol. Agglomerate samples were stored at controlled relative humidities and characterized by scanning electron microscopy, thermal gravametric analysis, sonic sifting and apparent and tap density techniques. A correlation was drawn between the humidity dependent glass transition temperature of the binder phase and the mechanical integrity of the agglomerates was determined. Three regions of compaction were identified through microstructural development and porosimetry. Frictional effects were found to be largely dependent upon die state of the lubrication. Mechanisms of compact sliding along the die wall were found to be a 'slip stick' motion for the unlubricated wall and a smooth motion with wall lubrication. Dissert. Abstr.

N82-20246 Virginia Polytechnic Inst. and State Univ., Blacksburg.
AN EXPERIMENTAL INVESTIGATION OF CUMULATIVE DAMAGE DEVELOPMENT IN GRAPHITE EPOXY LAMINATES Ph.D. Thesis
John Edward Masters, Jr. 1981 187 p
Avail: Univ. Microfilms Order No. 8126273

The results of an experimental investigation of cumulative damage development in laminated graphite epoxy plates are discussed. The general approach was to apply nondestructive test techniques to interrogate the specimens during loading. Principal results reported were obtained through the use of a surface replication technique. The goal was to define the physical mechanisms which lead to ultimate failure of the material. Two quasi-isotropic graphite epoxy laminates were subjected to quasi-static tension and tension-tension fatigue. The unnotched AS/3501-5 laminates had stacking sequences of [0/90/ +45/-45]s and [0/ +45/-45/90]s. Damage development in the form of transverse cracking in all off-axis lamina, longitudinal cracking and delamination was monitored throughout the tests. Results of the study include a detailed description of the chronology of events leading to failure of the two specimen types. A characteristic damage state indicates that, with increased loading, transverse cracks develop in all off-axis lamina until a uniform crack spacing is attained. Dissert. Abstr.

N82-20247*# Surface Analytic Research, Inc., Los Altos, Calif.
CARBON FIBERS CONDUCTIVITY STUDY Final Report
Cary Y. Yang and Aldona M. Butkus Aug. 1980 77 p refs
(Contract NAS2-10188)
(NASA-CR-166302; NAS 1.26:166302) Avail: NTIS HC A05/MF A01 CSCL 11D

In an attempt to understand the process of electrical conduction in polyacrylonitrile (PAN)-based carbon fibers, calculations were carried out on cluster models of the fiber consisting of carbon, nitrogen, and hydrogen atoms using the modified intermediate neglect of differential overlap (MINDO) molecular orbital (MO) method. The models were developed based on the assumption that PAN carbon fibers obtained with heat treatment temperatures (HTT) below 1000 C retain nitrogen in a graphite-like lattice. For clusters modeling an edge nitrogen site, analysis of the occupied MO's indicated an electron distribution similar to that of graphite. A similar analysis for the somewhat less stable interior nitrogen site revealed a partially localized II electron distribution around the nitrogen atom. The differences in bonding trends and structural stability between edge and interior nitrogen clusters led to a two-step process proposed for nitrogen evolution with increasing HTT. Author

N82-20248*# Boeing Military Airplane Development, Seattle, Wash. Advanced Airplane Branch.
ENVIRONMENTAL EFFECTS ON DEFECT GROWTH IN COMPOSITE MATERIALS Final Report
T. R. Porter Jan. 1981 418 p refs
(Contract NAS3-20405)
(NASA-CR-165213; NAS 1.26:165213) Avail: NTIS HC A18/MF A01 CSCL 11D

Data for evaluating the effects of moisture and temperature on the integrity of fiber composite components was gathered. In particular, the static and cyclic performance of three composite laminates containing flaws was investigated at room temperature and at 422 K (300 F) in wet and dry conditions. R.J.F.

N82-20249*# National Aeronautics and Space Administration, Washington, D. C.
THERMAL SHOCK RESISTANCE OF SILICON OXYNITRIDE
J. C. Glandus and P. Boch Dec. 1981 12 p refs Transl. into ENGLISH from Silicates Ind. France, v. 45, no. 2, 1980 p 45-48 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Limoges Univ., France
(Contract NASw-3541)

(NASA-TM-76665; NAS 1.15:76665) Avail: NTIS HC A02/MF A01 CSCL 11D

The thermal shock resistance of Si2N2O refractory material was studied. The thermal expansion coeff. is 3.55x10 to the -6th power at 20 to 800 C and 2.86x10 to the -6th power m/m/deg at 20 to 200 C. The breaking loads are high at high stress. Young's modulus E and the shear modulus G decrease linearly with increasing porosity. For dense material E sub o approx. = 216,500 N/sqmm and G approx = 90,600 N/sqmm. The Vickers hardness of the dense material is comparable to that of sapphire. The results on thermal shock show that R, the breaking load, stays constant for T < T sub c, the first cracks appear and R decreases sharply for T=T sub c. As the severity of the thermal shock is increased at T > T sub c, a small no. of new, large-size cracks appears. The shock's cumulative effect is negligible, and repeated shocks do not change the cracks. The low values of the thermal expansion coefficient and Young's modulus and the high tension breaking load are considered. Sintered Si2N2O with 5% MgO shows excellent cracking resistance under thermal shock. M.G.

N82-20250*# National Aeronautics and Space Administration, Washington, D. C.
STUDY OF PHENOMENA RELATED TO THE SINTERING PROCESS OF SILICON NITRIDE AT ATMOSPHERIC PRESSURE
A. Bertani Mar. 1982 15 p refs Transl. into ENGLISH from Metall. Ital. (Italy), v. 72, no. 12, Dec. 1980 p 535-538 Transl. by SCITRAN, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-76677; NAS 1.15:76677) Avail: NTIS HC A02/MF A01 CSCL 11D

A procedure was perfected for the production of components used in engineering applications of silicon nitride. Particles of complex geometry that combine remarkable mechanical properties with a high density are obtained. The process developed, in contrast to the 'hot pressing' method, does not use external pressures, and in contrast to the reaction bonding method, final densities close to the theoretical value are obtained. S.L.

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N82-20251 Illinois Univ. at Urbana-Champaign.
INFRARED RADIATION OF METAL OXIDATION CHEMICAL REACTION FLAMES Ph.D. Thesis
Richard Gary Adams 1981 183 p
Avail: Univ. Microfilms Order No. 8127542

Flames of metal oxidation chemical reactions, where metal vapors of alkali or alkali earth atoms react with strong oxidizers such as the halogen or nitrous oxide molecules were examined for their stimulated and spontaneous infrared radiative properties. Various thermodynamic, spectroscopic, and thermochemical parameters for the reaction product salt vapors were calculated in order to characterize energy transfer mechanisms and radiative emissions. Infrared spontaneous emission spectra were calculated and a computer program written for least squares determination of vibrational population distributions from experimental spectra. High temperature nozzle systems were designed and operated for fast flow and mixing of metal vapors and oxidizers. Experimental reaction chambers and associated detection optics were employed in measurements involving continuous wave infrared lasing potential, infrared spectrophotometric gain, infrared chemiluminescence, and associated visible chemiluminescence. Dissert. Abstr.

N82-20252 Delaware Univ., Newark.
AN EXPERIMENTAL INVESTIGATION OF THE HIGH PRESSURE FLUID PHASE EQUILIBRIUM OF HIGHLY ASYMMETRIC BINARY MIXTURES Ph.D. Thesis
Mark Anthony McHugh 1981 138 p
Avail: Univ. Microfilms Order No. 8128350

The high pressure fluid phase behavior of naphthalene CO2 and biphenyl CO2 mixtures was investigated. Solubilities of the heavy component naphthalene or biphenyl, in supercritical CO2 and mixture molar volumes are determined for various isotherms above the critical temperature of CO2 and over a pressure range of 75 to 500 atmospheres. The pressure temperature projection of the three phase solid-liquid-gas (S-L-G-) freezing point depression curve starting at the normal melting point of the heavy component and terminating at the intersection with the binary critical mixture curve, i.e., at the upper critical end point (UCEP) is visually determined for both systems. The naphthalene CO2 UCEP is estimated from solubility data to be in the vicinity of 60 C and 240 atmospheres in agreement with the results of the S-L-G experiments while the biphenyl CO2 UCEP estimated from solubility data to be in the vicinity of 56 C and 460 atmospheres could not be verified by the S-L-G experiments due to limitations in the experimental apparatus. Phase diagram constructions are used to qualitatively explain the phase behavior experimentally observed for both systems. Dissert. Abstr.

N82-20253 Ohio State Univ., Columbus.
MODELING AND ANALYSIS OF FLUIDIZED BED OPERATIONS Ph.D. Thesis
Michael Harold Peters 1981 149 p
Avail: Univ. Microfilms Order No. 8129076

Mathematical modeling of isothermal catalytic fluidized bed reactors and fluidized bed filters, and an experimental investigation of particle ejections into the freeboard region of a fluidized bed are considered. In general, the model solutions show good agreement to previously reported experimental results under both reactive and nonreactive conditions in the fluidized bed. Because of their lack of adjustable constants and more realistic descriptions of the gas flow patterns, the models developed are believed to be useful in the design and operation of gas-solid fluidized beds. The freeboard region is experimentally investigated using an image carrying fiber optic probe to scan bubble eruptions at the surface of the fluidized bed. High speed motion pictures revealed that the ejected particles come from the dome of an erupting bubble. However, the particles which make up the dome may come from beneath the surface. A mathematical model is proposed to describe the distribution of particle ejection velocities. Dissert. Abstr.

N82-20254 British Library Lending Div., Boston Spa (England).
PROCESS FOR THE REMOVAL OF OXIDES OF NITROGEN AND THE AQUEOUS SOLUTION USED
29 Oct. 1981 18 p Transl. into ENGLISH of Japanese Patent with the German Patent no. 26-58-548
(BLL-WH-489-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

A technique for removing the oxides of nitrogen from off-gases by a gas-liquid contact process is described. The off-gas is brought into contact with an aqueous solution containing an ion or compound with a reductive action on the oxides of nitrogen. The solution used contains water and (1) at least one hydrazine compound (selected from the group: hydrazine, hydrazine hydrate and salts of inorganic acids of hydrazine; (2) a bivalent or trivalent iron ion; and (3) an organic compound suitable for forming a chelate compound with the iron ion or an alkali metal salt of the organic compound. M.G.

N82-20255 British Library Lending Div., Boston Spa (England).
GAS-LIQUID CHROMATOGRAPHY OF SOME ALIPHATIC AND HETEROCYCLIC MONO- AND POLYFUNCTIONAL AMINES
R. F. Brookes, A. A. Anderson, S. P. Yurel, M. V. Shimanskaya, and L. O. Golender 18 Jan. 1982 16 p refs Transl. into ENGLISH from Izv. Akad. Nauk Latv. SSR, Ser. Khim. (USSR), 1973 p 51-63
(BLL-Trans-2256-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

The retention data for amines in the behavior of nitrogen compounds of different polarities in stationary phase are described. The retention indices system, which is based on comparisons between compound retention and normal hydrocarbons is the

most promising characterization in gas chromatography. Retention indices of a large number of aliphatic primary, secondary mono and polyamines, aromatic amines, and nitrogenous heterocycles for extension of the relationship between chromatographic properties and the structure of amino compounds are determined. A basis for the nonstandard identification of nitrogenous organic compounds is provided. E.A.K.

N82-20256*# National Aeronautics and Space Administration, Washington, D. C.
FUNCTIONAL MEMBRANES. PRESENT AND FUTURE
Toyoki Kunitake Jan. 1982 24 p refs Transl. into ENGLISH from Yuki Gosei Kagaku Kyokai Shi (Japan), v. 39, no. 6, 1981 p 477-486 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76667; NAS 1.15:76667) Avail: NTIS HC A02/MF A01 CSCL 07D

The present situation and the future development of the functional membrane are discussed. It is expected that functional membranes will play increasingly greater roles in the chemical industry of the coming decade. These membranes are formed from polymer films, liquid membranes or bilayer membranes. The two most important technologies based on the polymeric membrane are reverse osmosis and ion exchange. The liquid membrane is used for separation of ionic species; an extension of the solvent extraction process. By using appropriate ligands and ionophores, highly selective separations are realized. The active transport is made possible if the physical and chemical potentials are applied to the transport process. More advanced functional membranes may be designed on the basis of the synthetic bilayer membrane. Author

N82-20257# National Inst. for Water Research, Pretoria (South Africa).
NIWR INTERLABORATORY COMPARISON STUDY NO. 80/B: DETERMINATION OF TRACE METALS. EVALUATION OF TRACE METALS
R. Smith 1981 34 p refs
(CSIR-RR-394; ISBN-0-7988-2086-1) Avail: NTIS HC A03/MF A01

Analytical results from southern African laboratories engaged in water and wastewater analysis are compared. The analysis of synthetic water samples by 28 laboratories for cadmium, chromium, copper, iron, lead, manganese, zinc, arsenic, selenium and mercury is evaluated and discussed. With one exception, where inductively-coupled plasma optical emission spectroscopy was used, all the determinations were carried out by means of atomic absorption spectrophotometric methods. J.D.H.

N82-20258*# Tylan Corp., Torrance, Calif.
[AUTOMATED SEMICONDUCTOR VACUUM CHEMICAL VAPOR DEPOSITION FACILITY] Final Report
[1982] 8 p
(Contract NAS8-31617)
(NASA-CR-161269; NAS 1.26:161269) Avail: NTIS HC A02/MF A01 CSCL 07D

A semiconductor vacuum chemical vapor deposition facility (totally automatic) was developed. Wafers arrived on an air track, automatically loaded into a furnace tube, processed, returned to the track, and sent on to the next operation. The entire process was controlled by a computer. L.F.M.

N82-20259*# Tylan Corp., Torrance, Calif.
[AUTOMATED SEMICONDUCTOR DIFFUSION AND OXIDATION FACILITY] Final Report
[1982] 8 p
(Contract NAS8-31612)
(NASA-CR-161268; NAS 1.26:161268) Avail: NTIS HC A02/MF A01 CSCL 07D

A semiconductor diffusion and oxidation facility (totally automated) was developed. Wafers arrived on an air track, automatically loaded into a furnace tube, processed, returned to track, and sent on to the next process. The entire process was controlled by a computer. L.F.M.

N82-20260*# National Aeronautics and Space Administration, Washington, D. C.
REACTIVITY OF C-NUCLEOPHILIC COMPOUNDS WITH PARTICULAR CONSIDERATION OF PYRYLIUM AND THIOPYRYLIUM SALTS, 1ST REPORT
Richard Neidlein and Ingo Koerber Aug. 1981 13 p refs Transl. into ENGLISH from Arch. Pharm. (Weinheim, Ger.), no. 311, 1978 p 236-243 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-76679; NAS 1.15:76679) Avail: NTIS HC A02/MF A01 CSCL 07D

The reactivity of C nucleophilic pyrylium and thiopyrylium salts towards derivatives of gamma pyrone was studied. The new compounds 3, 5-12, 15, 17, 20a-20f, 21 and 22 were obtained. Author

N82-20261*# National Aeronautics and Space Administration, Washington, D. C.
PECULIARITIES OF SPECTRA OF INDUCED EMISSION OF POLYMETHINE DYE SOLUTIONS AT LOW TEMPERATURES
M. V. Melishchuk, Ye. A. Tikhonov, and M. T. Shpak Aug. 1981 12 p refs Transl. into ENGLISH from Ukr. Fiz. Zh. (USSR), v. 20, no. 3, 1975 p 360-366 Translation was announced as A75-31603 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3199)
(NASA-TM-76680; NAS 1.15:76680) Avail: NTIS HC A02/MF A01 CSCL 07D

Results from studying the induced emission spectra with monochromatic excitation (superluminescent regime) within a temperature range of 300 K - 5.2 K are presented. The significant feature of such operations is the appearance of quasi-lines whose minimum width is realized at 4.2 K. The frequency distribution of the quasi-lines unambiguously characterizes the dye investigated. When interpreting these results, the idea of an inhomogeneous broadening of the polymethine dye spectra in the solution being studied experimentally was used for the first time. The quasi-lines observed are interpreted as a manifestation of the electron vibration structure of singlet states of a complex molecule. Author

N82-20262 British Library Lending Div., Boston Spa (England).
RADIOACTIVE LIQUID COLUMN CHROMATOGRAPHY (RLC). PART 1: TRIALS ON THE CONTINUOUS MONITORING OF BETA-RADIOACTIVITY IN LC-ELUATES
K. Figge (NATEC), H. Piater (NATEC), and W. Kolbe 18 Jan. 1982 8 p ref Transl. into ENGLISH from G-I-T. Fachzeitschrift Fuer das Lab. (West Germany), 19th Year, Mar. 1975
(BLL-Trans-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

For the production and purity control of the radio indicators and especially for the analysis of radioactive mixtures of substances the preparative and analytical liquid column chromatography is an indispensable aid. Two flow cells for universal use in the continuous monitoring of the radioactivity in the eluate of liquid chromatography columns were developed. Detector systems in radio liquid column chromatography were surveyed and the new flow cells were described. S.L.

N82-20263# Johns Hopkins Univ., Baltimore, Md. Dept. of Chemistry.
QUANTUM CHEMICAL AND THEORETICAL INVESTIGATIONS OF TOXICITY Annual Technical Report, 1 Dec. 1980 - 15 Nov. 1981
Joyce J. Kaufman 20 Nov. 1981 41 p
(Contract N00014-81-K-0007)
(AD-A108329; ATR-1) Avail: NTIS HC A03/MF A01 CSCL 07/4

The ultimate desire is to formulate and implement a global approach to quantum chemical and theoretical prediction of toxicity. This is a rational and attainable goal based on our closely related experience with a wide variety of molecules with diverse biological and pharmacological effects. The objective of the present research is more closely focussed; namely, to demonstrate the feasibility of quantum chemical and other theoretical techniques in the correlation and then in the prediction of toxicity of a specific class of compounds. The family of compounds we chose were the organophosphorus pesticides and

nerve gas family since these both have relatively clearcut one dose acute lethal toxicity, LD sub 50, and ED sub 50 for the triggering event, inhibition of acetylcholinesterase, to serve as well-defined end points. We expected to be able to identify particular quantum chemical requisites which are related to and predictive of the toxic effects of these molecules and our preliminary quantum chemical results on the organophosphorus compounds already show that we have been successful in this endeavor. We carried out ab-initio calculations on a number of phosphorus compounds including the two optical isomers of GB using our own rapid efficient computer programs which incorporate a number of desirable options for ab-initio calculations on large molecules including ab-initio effective core model potentials (MODPOT) which enable calculations of valence electrons only explicitly, yet accurately, and a charge conserving integral prescreening evaluation (which we named VRDDO variable retention of diatomic differential overlap) especially effective for spatially extended molecules. GRA

N82-20264# EIC, Inc., Newton, Mass.
AN IR SENSITIVE, REAL-TIME IMAGING TECHNIQUE BASED ON A PHOTOELECTROCHEMICAL CELL
Ronald H. Micheels and R. David Rauh Dec. 1981 19 p refs Submitted for publication
(Contract N00014-79-C-0700; NR Proj. 359-723)
(AD-A108991; TR-3) Avail: NTIS HC A02/MF A01 CSCL 07/4

A real time imaging technique based on optical saturation phenomena in photoelectrochemical cells was developed. The long wavelength spectral sensitivity of these devices extends to the bandgap energy of the semiconductor photoelectrode employed. An image resolution of 180 microns and a response time of better than 100 msec was obtained with an n-GaAs cell. GRA

N82-20265# University of Southern California, Los Angeles. Dept. of Mechanical Engineering.
THE 1981 AFOSR CONTRACTORS MEETING ON AIR BREATHING COMBUSTION DYNAMICS AND EXPLOSION RESEARCH Interim Report, 21-25 Sep. 1981
B. T. Wolfson, N. Gerstein, and Roy Choudhury Sep. 1981 199 p refs Meeting held at Clearwater, Fla., 16-20 Nov. 1981
(Grant AF-AFOSR-3354-77; AF Proj. 2308)
(AD-A108977; AFOSR-81-0844TR) Avail: NTIS HC A09/MF A01 CSCL 21/2

The report consists of a collection of expanded abstracts of the numerous research progress reports given by AFOSR supported contractors on the Air Force basic research program on Energy Conversion Related to Air-Breathing Propulsion and Explosions and of invited papers from other governmental agencies and contractors. These papers presented over a five-day period composed the 1981 contractors meeting on Air-Breathing Combustion Dynamics and Explosion Research. The principal investigators and their organizational association are also identified. Author (GRA)

N82-20266# Virginia Univ., Charlottesville. Dept. of Chemistry.
BORANAMETALLACARBORANES. 1: SYNTHESIS AND CHARACTERIZATION OF (BORANE)COBALT(CARBORANE) SANDWICH COMPLEXES Interim Report
Lester Borodinsky and Russell N. Grimes Dec. 1981 41 p refs Submitted for publication. Sponsored in part by NSF
(Contract N00014-75-C-0305)
(AD-A109384; TR-39) Avail: NTIS HC A03/MF A01 CSCL 07/3

The first known examples of borane-metal-carborane sandwich complexes, in which a metal atom simultaneously occupies vertices in a metallaborane and a metallacarborane framework, have been obtained from reactions of B5H8- or B9H14- ions with CoCl2 in THF, followed by addition of R2C2B4H5ion (R = CH3 or C2H5). With B5H8- and (C2H5)2C2B4H5-, the characterized products are (2,3-(C2H5)2C2B4H4)-2-Co-(B5H10) (I), (2,3-(C2H5)2C2B4H4)-5-Co(B9H12-1-0(CH2)4) (II), and (2,3-(C2H5)2C2B3H5)-5-Co(B9H12-1-0(CH2)4) (III). With B9H14- as the borane reagent, the products are (2,3-(C2H5)2C2B3H5)-6-Co-(B9H12-2-0(CH2)4) (IV) and (1,2-(C2H5)2C2B7H7)-6-Co-(B9H12-2-0(CH2)4) (V), as well as traces of I, II, and III. Except for I, an orange oil, all products are crystalline solids. GRA

N82-20267# Naval Research Lab., Washington, D. C. Chemical Diagnostics Branch.
NITROGEN TRIFLUORIDE COMBUSTION AND SUPPRESSION Final Report
J. R. Wyatt and J. J. DeCorpo 7 Oct. 1981 35 p refs
(AD-A109447; NRL-8513) Avail: NTIS HC A03/MF A01 CSCL 21/2

Halon 1301 has been determined to be effective in suppressing the combustion of ethylene in a nitrogen trifluoride enriched atmosphere. Approximately 6.5% halon 1301 is required to extinguish a laboratory model ethylene-air flame. For each 1% nitrogen trifluoride enrichment, 0.88% halon 1301 is required for extinguishment. Additionally, in explosion tests halon 1301 is capable of significantly reducing the severity of the reaction. Author (GRA)

N82-20268# Aerospace Corp., El Segundo, Calif. Chemistry and Physics Lab.
RATE COEFFICIENTS FOR THE REACTIONS OF BF WITH O AND O2 Interim Report
G. C. Light, R. R. Herm, and J. H. Matsumoto 21 Dec. 1981 18 p refs
(Contract F04701-81-C-0082)
(AD-A109568; TR-0082(2945-04)-1; SD-TR-81-101) Avail: NTIS HC A02/MF A01 CSCL 07/4

Despite the wide variety of hydride, halide, oxide, oxyhydride, oxyhalide, and other species that can form, there is a scarcity of experimental data available on the rates of reactions of boron compounds. This is especially true for the potentially more interesting compounds wherein the boron atom is formally in a low valence state. The only set of direct kinetic measurements is a recent room-temperature-diffusion flame determination of the rates of oxidation of gaseous boron atoms by some inorganic oxides. Other related information is limited to indirect inferences provided by studies of the reaction of oxygen atoms with diborane and the chemiluminescent reactions of boron atoms. This lack of information is particularly unfortunate because of boron's unique position in the periodic table. The chemistry of metal atoms and their compounds, for example, halides, is often quite different from that of the nonmetals, and boron is the lightest element that divides these two regions of the periodic table. This is a report of the first results from our laboratory of a flow-tube study of some reaction rates of boron monofluoride, BF. GRA

N82-20269# Brown Univ., Providence, R. I. Dept. of Chemistry.
RAMAN STUDY OF THE MECHANISM OF ELECTRICAL SWITCHING IN Cu TCNQ FILMS
E. I. Kamitsos, C. H. Tzinis, and W. M. Risen, Jr. 5 Jan. 1982 21 p refs Submitted for publication
(Contract N00014-75-C-0883; NR Proj. 051-539)
(AD-A109737; TR-82-01) Avail: NTIS HC A02/MF A01 CSCL 07/4

The mechanism of electrical switching in Cu/Cu TCNQ films has been studied in situ by Raman spectroscopy. The initial film is Cu(+)TCNQ(-), while neutral TCNQ was found to be present in the system after electrical switching, produced by a redox reaction caused by the field. The amount of TCNQ after switching was found to increase with the time of application of the electric field, while the amount of Cu TCNQ was reduced. Author (GRA)

N82-20270# Indiana Univ. at Bloomington. Dept. of Physics.
ETHYLENE ADSORPTION AND REACTION ON Pd(111): AN ANGLE DEPENDENT EELS ANALYSIS
L. L. Kesmodel and J. A. Gates 28 Dec. 1981 20 p refs
(Contract N00014-80-C-0147)
(AD-A109722; TR-2) Avail: NTIS HC A02/MF A01 CSCL 07/4

The chemisorption and surface reactivity of ethylene on a palladium (111) surface near room temperature has been studied by high-resolution electron energy loss spectroscopy (EELS). The C2H4 molecule reacts with the Pd(111) surface to form a rather stable surface species which is identified as ethylidyne (C(3+)-CH3) by analysis of the EELS vibrational spectra. This molecule is also formed on Pt(111) and Rh(111) and is believed to be

symmetrically bonded at threefold surface sites. Angle-dependent EELS spectra are reported and show the relative importance of impact and dipole excitation mechanisms. Off-specular data is found to be of critical importance in drawing conclusions about surface bonding symmetry from EELS spectra. GRA

N82-20271# North Carolina Univ. at Chapel Hill. Labs. of Chemistry.

PERMEATION OF ELECTROACTIVE SOLUTES THROUGH ULTRATHIN POLYMERIC FILMS ON ELECTRODE SURFACES

T. Ikeda (Kyoto Univ.), P. Denisevich, K. William, and Royce W. Murray 18 Dec. 1981 57 p refs Submitted for publication. Sponsored in part by NSF

(Contract N00014-76-C-0817; NR Proj. 359-623)

(AD-A109476; TR-20) Avail: NTIS HC A04/MF A01 CSCL 07/4

The rates of permeation of a series of electroactive solutes, bromide, ferrocene, benzoquinone, diquat, (Ru(bpy)2Cl2), (Fe(bpy)2(CN)2), and (Ru(bpy)2(py)Cl)(+) have been measured through ultrathin, electrochemically polymerized films like poly-(Ru(vbpy)3-2plus 2 valence. The films are coated on Pt disk electrodes. The permeabilities, expressed as PDS, pol, the product of a partition coefficient and a diffusion coefficients in the films, range from very fast (bromide, greater than 4 X 10 to the -7 square centimeters/sec.). The permeation rates vary linearly with films thickness; this and the molecular size discrimination rule out transport through larger-than-molecular-dimensional channels and pinholes in the film. The film permeability process is described as membrane diffusion. Relatively pinhole-free films are preparable as thin as 20 - 40 angstroms. Author (GRA)

N82-20272# North Carolina Univ. at Chapel Hill. Labs. of Chemistry.

BINDING OF PENTACHLOROIRIDITE TO PLASMA POLYMERIZED VINYLPYRIDINE FILMS AND ELECTROCATALYTIC OXIDATION OF ASCORBIC ACID

J. Facci and Royce W. Murray 21 Dec. 1981 35 p refs Submitted for publication

(Contract N00014-76-C-0817)

(AD-A109475; TR-19) Avail: NTIS HC A03/MF A01 CSCL 07/4

Coordination of (IrCl5(acetonato)) minus 2 values in acetone/methylene chloride to a film of vinyl-pyridine RF plasma polymerized on a carbon electrode results in an electrode surface wave at +0.40 volt vs. S.C.E. in 1 M H2SO4. This potential is more negative than expected for -PyIrCl5 minus 2 values coordination. Charge transport in the film is very fast and the film catalyzes the oxidation of ascorbic acid at a diffusion controlled rate. The film electrochemistry is sensitive to the choice of supporting electrolyte cation but not anion. Author (GRA)

N82-20273# GCA Corp., Bedford, Mass. Technology Div.

AN ULTRASENSITIVE ELECTRON (SOFT X-RAY) SILVER HALIDE/CHALCOGENIDE NEGATIVE OR POSITIVE INORGANIC RESIST Final Report

Jerome M. Lavine Dec. 1981 35 p refs

(Contract N00014-79-C-0788; NR Proj. 383-052; RF62581802)

(AD-A109818; GCA-TR-81-132-G) Avail: NTIS HC A03/MF A01 CSCL 20/8

Successful Ag photodoped As2S3 was obtained using photographic Ag derived from evaporated AgBr. The use of evaporated AgBr resulted in a 1000 fold increase in speed. It is shown that evaporated AgBr has very high sensitivity in the deep UV (50 microJ/sq cm at 2600 angstroms), at soft X-ray wavelengths (5 microJ/sq cm at 7 angstroms) and confirmed the previously observed e-beam sensitivity of 10-9 coulombs/sq cm. It is shown that using evaporated AgBr as the photon sensitive layer of a multilayer photoresist system for submicron lithography is feasible. GRA

N82-20274# Letterman Army Inst. of Research, San Francisco, Calif.

A COMPUTER PROGRAM TO PROCESS SPECTROPHOTOMETRIC ANALYTICAL DATA ASSOCIATED WITH CURVILINEAR ABSORBANCE/CONCENTRATION RELATIONSHIPS Final Report, May - Oct. 1981

John J. Knudsen and Evelyn L. Mcgown Nov. 1981 59 p refs

(AD-A109597; LAIR-110) Avail: NTIS HC A04/MF A01 CSCL 07/4

A computer program designed to provide a simple, and accurate method for evaluating spectrophotometric assay data accommodates both linear and nonlinear standard curves. The program requires manual entry by keyboard of absorbance and concentration values for the standard curve and absorbance values for the test samples. It will process up to 4 dilutions of each test sample and thus it can accommodate batches of samples containing widely differing concentrations of test compound. A regression equation (up to 4th degree) is calculated to describe the standard curve with concentration as the independent variable and absorbance as the dependent variable. Concentrations in unknown samples are calculated from absorbance by using a method of successive approximations. A hard copy data printout lists input data, concentration of test substance in each sample, statistical data concerning the estimate of the standard curve, and a plot of the standard curve. GRA

N82-20275# Rockwell International Corp., Anaheim, Calif. Autonetics Strategic Systems Div.

LANTHANIDE DIPHTHALOCYANINES. ELECTROCHEMISTRY AND DISPLAY APPLICATIONS

Margie M. Nicholson Jan. 1982 39 p refs Submitted for publication

(Contract N00014-77-C-0636; NR Proj. 359-667)

(AD-A109789; TR-4) Avail: NTIS HC A03/MF A01 CSCL 07/4

Electrode films of lanthanide diphthalocyanines undergo a series of reversible color changes that make them potentially very attractive as flat-panel color display materials. Research on these compounds has revealed a complex scheme of electrode processes that is not yet fully characterized. The solid organic phases within the faradaic system include new room-temperature anion and cation conductors, as well as electronic semiconductors. Application of diphthalocyanine electrochromics to practical display products will depend on development of adequate cycle life and a technique for matrix addressing. Author (GRA)

N82-20276# Indiana Univ. at Bloomington. Dept. of Physics

VIBRATIONAL SPECTROSCOPY WITH ANGLE-DEPENDENT EELS: ACETYLENE CHEMISORPTION ON Pd (111)

J. A. Gates and L. L. Kesmodel 28 Dec. 1981 23 p refs

(Contract N00014-80-C-0147)

(AD-A109918; TR-3) Avail: NTIS HC A02/MF A01 CSCL 07/4

High resolution electron energy loss measurements and LEED observations for normal and deuterated acetylene chemisorbed on Pd(111) are reported. Analysis of specular and off-specular energy loss data permits classification of the vibrational modes in terms of long-range dipole and short-range impact scattering mechanisms. Impact scattering intensities are found to be relatively strong for some modes and comparable in strength to intensities of dipole-excited modes. Author (GRA)

N82-20277# Physical Sciences, Inc., Woburn, Mass.

SYNTHETIC-FUEL COMBUSTION: POLLUTANT FORMATION. SOOT-INITIATION MECHANISMS IN BURING AROMATICS Fourth Quarterly Report, 1 Jul. - 30 Sep. 1981

W. T. Rawlins, S. P. Schertzer, and T. Tanzawa Nov. 1981 43 p refs

(Contract DE-AC22-80PC-30292)

(DE82-002566; DOE/PC-30292/4; PSI-TR-291) Avail: NTIS HC A03/MF A01

The pyrolysis rates, free radical kinetics, and soot and NO/sub x/ formation mechanisms for a variety of aromatic families such as those of benzene, anisole, phenol, and nitrogen heterocyclics were examined. The processes are studied in shock tubes, where combustion temperatures is attained almost instantly without wall effects and under well controlled flow conditions. Experiments are performed in incident shock waves, using optical absorption and emission diagnostics in the ultraviolet, visible, and infrared. It is indicated that soot formation is minimal for pyridine and proceeds rapidly for toluene, and a bimodal mechanism above 2000 K is shown. Comparison of ultraviolet and visible attenuation

signals indicates that the mean size of the soot particles causing the attenuation is considerably larger than previously assumed, and requires the use of complete Mie theory rather than the Rayleigh limit in data interpretation. DOE

N82-20278# Utah Univ., Salt Lake City.
DYNAMICS AND MECHANISMS OF CATALYTIC PROCESSES AND HOT CHEMISTRY Progress Report, 1 Mar. 1981 - 28 Feb. 1982
Leonard D. Spicer Oct. 1981 13 p refs
(Contract DE-AS02-76ER-02190)
(DE82-003657; DOE/ER-02190/2) Avail: NTIS HC A02/MF A01

Photo assistance in catalytic hydrogenation with Wilkinson's Catalyst was studied. An increased rate for hydrogenation of cyclohexene and 1-hexene during irradiation and a modification of selectivity which initiates isomerization of 1-hexene to 2-hexene during and after irradiation was observed. The isomerization kinetics are first order in light over the uv visible range of wavelengths greater than 300 nm. The high quantum yields and turnover numbers for the photo assisted processes are observed. The new reaction between sulfur dioxide and hexamethyldisilazane is characterized further. The stoichiometry and mechanism for acid base reaction are reported. The reaction represents a facile silylation process in the absence of an acidic hydrogen which produces the synthetically and analytically useful sulfinyl silanamine. The dynamical model recoil processes is applied to the moderated nuclear recoil technique for measuring thermal rate constants. The recoil spectrum for chlorine 36 produced via the (n, (BETA)) process is calculated from the prompt gamma ray spectrum. DOE

N82-20279# Ohio Univ., Athens. Dept. of Chemistry.
INVESTIGATIONS OF THE CHANGES OF COAL STRUCTURE OCCURRING DURING GASIFICATION Progress Report
P. R. Griffiths 26 Oct. 1981 21 p refs
(Contract DE-FG22-80PC-30210)
(DE82-002652; DOE/PC-30210/T2) Avail: NTIS HC A02/MF A01

The feasibility of the application of diffuse reflectance infrared Fourier transform (DRIFT) spectrometry to the study of gas/solid reactions was demonstrated. The high signal to noise ratio (SNR) allows application of Fourier self deconvolution routines to increase the spectra information content. The combination of DRIFT spectrometry and Fourier self deconvolution enables the study of the mechanism of coal reactions and catalytic reactions to provide more information. DOE

N82-20280# Department of Energy, Grand Forks, N. Dak. Energy Technology Center.
ANALYSES OF THE NORTHERN GREAT PLAINS PROVINCE LIGNITES AND SUBBITUMINOUS COALS AND THEIR ASH
S. A. Cooley Jul. 1981 139 p refs
(DE81-028366; DOE/GFETC/RI-81/2) Avail: NTIS HC A07/MF A01

A compilation of analyses of North Dakota and Montana low-rank coals (lignites and subbituminous coals) and of their ash extends the data base for these coals. Samples both from exploratory core drilling and from auger-drilling at operating mines were evaluated to obtain a wider distribution of data. Averages and standard deviations were calculated for North Dakota and Montana mines, and correlations were investigated for east-west locations depending on geographic ranges. Highest variability for both coals was in moisture and ash contents, with moisture- and ash-free analyses being relatively uniform for each. Composition of ash exhibited wide variability, especially in sodium and calcium contents. Sulfur contents were quite variable, but the average content was usually low. Within-mine variability was usually similar to that between mines. In the eastern Montana transitional area between lignite and subbituminous coals, special precautions in sampling are required to permit accurate classification from analyses. Despite care in selection of representative cores, core samples were indicated to be less uniform in analyses than auger-drilled samples obtained from the same mine. DOE

N82-20281# SRI International Corp., Menlo Park, Calif.
EXPLORATORY STUDY OF COAL-CONVERSION CHEMISTRY Final Report, 20 Sep. 1979 - 19 Mar. 1981
D. S. Ross, D. McMillen, W. Ogier, and Q. Nguyen 12 Aug. 1981 95 p refs
(Contract DE-AC22-79ET-14855)
(DE82-001104; DOE/ET-14855-19) Avail: NTIS HC A05/MF A01

The rates at which the strong carbon-carbon and carbon-oxygen central bonds in hydroxydiphenylmethanes and hydroxydiphenyl ethers are broken, under homogeneous conditions, in tetralin at 4000C, were examined by tautomerization to the weakly bonded keto forms followed by homolysis of the central bonds. These homogeneous decomposition mechanisms bear directly on the susceptibility of these linkages to homogeneously and heterogeneously catalyzed cleavage. Iron oxides, particularly Fe3O4, are effective and selective catalysts for these same cleavages. Relative catalyst effectiveness suggests that the mechanism of catalysis involves radical cation formation. The conversion of coal to benzene soluble coal products in CO/H2O systems displays a dependence on the pH of the starting aqueous phase. The increase in conversion is paralleled by an increase in the reaction rate of the water gas shift reaction. Potassium or sodium salts of molybdate, dichromate, and permanganate were effective for coal conversion. The catalytic activity of these salts depends on the starting pH of the aqueous solution adjusted with dilute KOH or HCL solutions. It is indicated that despite the catalytic activity of metal oxyanions, the changes in conversion are large over small pH changes; plots of conversion versus initial pH are S-shaped curves similar to common titration curves. DOE

N82-20282# Battelle Columbus Labs., Ohio.
THERMOPHYSICAL PROPERTIES OF COAL LIQUIDS Quarterly Technical Status Report, 1 Jul. - 30 Sep. 1981
J. W. Droege, R. Venkateswar, and S. P. Chauhan 20 Oct. 1981 25 p
(Contract DE-AC22-79ET-14941)
(DE82-002502; BMI-2087; QTSR-8) Avail: NTIS HC A02/MF A01

Cross plots showing viscosity as a function of temperature at constant exposure times are presented. These plots show the effect of solvent-to-coal ratio. A few measurements of enthalpy obtained with a drop calorimeter were made. The relationship of this work to the pilot plant design for solvent refined coal is described. DOE

N82-20283# Virginia Commonwealth Univ., Richmond. Dept. of Chemistry.
SUPPORTED METAL CARBONYLS: NEW CATALYSTS FOR LIQUEFACTION OF COAL Semiannual Technical Report
G. A. Melson 1981 6 p ref
(Contract DE-AC22-81PC-41761)
(DE82-002659; DOE/PC-41761/T1) Avail: NTIS HC A02/MF A01

Supported metal catalysts prepared from carbonyls and both simple and complex oxides (zeolites) were prepared by a newly developed procedure. Results of characterization by a variety of spectroscopic techniques are presented. DOE

N82-20284# Lummus Co., Bloomfield, N. J.
INTEGRATED TWO-STAGE LIQUEFACTION PARAMETRIC STUDY Quarterly Technical Progress Report, 1 Oct. - 31 Dec. 1980
H. D. Schindler, J. M. Chen, and J. D. Potts (Cities Service Research and Development Co., Tulsa, Okla.) Aug. 1981 66 p
(Contract DE-AC22-79ET-14804)
(DE81-028756; DOE/ET-14804/T2) Avail: NTIS HC A04/MF A01

A research study on Catalytic Expanded Bed Hydroprocessing of coal extracts and the operation of an integrated Two-Stage Liquefaction process development unit was made. Equilibration of the recycle paste solvent was achieved. Three short contact time runs were made with equilibrium solvent. Conversions ranged from 88 to 95 percent at hydrogen consumptions of 0.41 to 2.40 percent of moisture, ash-free coal. Considerable hydrogen was transferred from the solvent to the coal. The recycle

solvent contained 23 to 48 percent 8500 F+. The LC-Finin bottoms constituted about 70 percent of the recycle solvent. The deasher recovered 71 to 80.5 percent of the extract from the SCT unit. Ash concentrations of less than 0.10 percent in the recovered extract were achieved. Nitrogen concentrations in the distillate products were below 0.2 percent. Both the catalyst activity and the product quality were the highest obtained thus far in the hydrocracking of coal extracts. An overall yield structure was calculated, based on the results of this period. The distillate (C5-8500F) yield was 3.29 barrels per ton of moisture, ash-free coal at a hydrogen consumption of 4.78 percent based on MAF coal. DOE

N82-20285 California Univ., San Diego.
STUDIES IN SHOCK-TUBE SPECTROSCOPY, CHEMICAL REACTION RATES AND MECHANISMS, UTILIZATION OF LOW-BTU GASES, AND GEOTHERMAL ENERGY. 1: SHOCK-TUBE SPECTROSCOPY. 2: SHOCK-TUBE STUDIES OF CHEMICAL REACTION RATES AND MECHANISMS. 3: UTILIZATION OF LOW-BTU GASES. 4: VOLCANOES AS A SOURCE OF GEOTHERMAL ENERGY Ph.D. Thesis
Jules Michael Kline 1981 180 p
Avail: Univ. Microfilms Order No. 8125440

Correlation-absorption measurements of the (0,0) band of the NO photon system at 2250 A and emission measurements of the neutrino sub 3 fundamental of N2O at 4.52 microns are described. Use of a revised Voigt parameter for the NO photon bands, it is shown, leads to an increased value of f sub 00. Measurement of an off peak spectral absorption coefficient for an isolated spectral line using a laser light source is described. The observed temperature and pressure dependence of the spectral absorption coefficient of CH2O at the HeXe laser line is accounted for. Thermal decomposition of N2O behind reflected shock waves for 1685< or = T, deg K< or = 2560 are studied. CH2O pyrolysis and oxidation by N2O behind reflected shock waves for 1200< or = T, deg K< or = 2200 are studied. Measurements of induction times and post induction conversion rates for H2-containing low Btu gas mixtures are described. Burning rates, heat-release rates, induction times, specific burning times and specific reduced burning volumes are determined for mixtures typical of in situ shale oil retorting. The potential use of volcanoes as a source of geothermal energy is described. Dissert. Abstr.

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N82-20286 Virginia Polytechnic Inst. and State Univ., Blacksburg.
HYDROGEN ASSISTED CRACK GROWTH IN MILD STEEL Ph.D. Thesis
Thomas Allen Adler 1981 231 p
Avail: Univ. Microfilms Order No. 8126244

The effects of 10.3 to 13.8 MPa (1500 to 2000 psi) hydrogen on the mechanical properties and crack growth resistance of A106 grade B steel was investigated with precracked compact tension specimens and tensile specimens. The resistance to crack growth of the precracked specimens was less in hydrogen than in oxygen. There seemed to be a need for hydrogen to be present during plastic deformation for the lowered crack growth resistance to occur. The reduced resistance of mild steels to crack growth in hydrogen, as compared to oxygen, will have to be considered in applications in which mild steel are exposed to hydrogen environments. Explanations were given for the lower resistance to crack growth, the increase in the flow stress, and the change in the crack propagation mode. Dissert. Abstr.

N82-20287 British Library Lending Div., Boston Spa (England).
INVESTIGATION INTO CRACKS UNDER PLATING BY MEANS OF ULTRASONIC INSPECTION
G. M. Gatti, L. DiTeodoro, and R. DeSantis 21 Apr. 1981 16 p Transl. into ENGLISH from Metall. Ital. (Italy), v. 67, Pt. 9, 1975 p 509-512
(BLL-Risley-TR-4191-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

Small cracks with intergranular movement localized in specific zones appear at the metal plating interface of plated ferritic material used in the manufacture of pressure vessels for nuclear power reactors. A method of ultrasonic examination which allows the presence of the defects in question to be revealed with a high degree of reliability is described. S.L.

N82-20288 British Library Lending Div., Boston Spa (England).
REPLACING COBALT BY NICKEL
M. Ducos (SFEC) 5 Jan. 1981 7 p Transl. into ENGLISH of "Remplacement de Base Cobalt par une Base Nickel" conf. paper France, 1980 Presented at the Intern. Colloq. on Hardfacing Mater. in Nucl. Power Plants, France, 25-26 Sep. 1980
(BLL-Risley-TR-4362-(9091.9F)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

A comparison of the composition, structure, and physical properties of a gas deposited nickel based alloy, FR452, with that of the Stellite 6 cobalt alloy commonly used as a hardfacing material in the coolant circuits of nuclear reactors is presented. Corrosion testing of FR452 indicated comparable corrosion resistance with Stellite 6. Test coupons of the nickel alloy demonstrated the same surface defects as did Stellite 6. J.D.H.

N82-20289 British Library Lending Div., Boston Spa (England).
PROPERTIES OF CENIUM ALLOYS, HARDFACING MATERIALS WITHOUT COBALT
C. Lelong (CEA), C. Benhamou (FRAMATOME), and D. Moulin (Creusot) [1981] 20 p Transl. into ENGLISH of "Propriete des Alliages Cenium, Materiaux Durs pour Frottement sans Cobalt" conf. paper France, 1980 Presented at the Intern. Colloq. on Hardfacing Mater. in Nucl. Power Plants, France, 25-26 Sep. 1980
(BLL-Risley-TR-4366-(9091.9F)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

A program to characterize CENIUM alloys, aimed at determining their ability to replace cobalt alloys which are used at present in steam plant fittings in the primary circuits of pressurized water reactors is discussed. The program includes the study of the structure of the alloys, their mechanical and physical properties, corrosion behavior, working ability (welding torch, TIG, plasma) and behavior in wear tests simulating working conditions. Author

N82-20290 British Library Lending Div., Boston Spa (England).
STRUCTURE OF LASER MELTED STEEL SURFACES
Hans W. Bergmann and Barry L. Mordike 24 Jun. 1981 27 p refs Transl. into ENGLISH from Z. Metallkd. (West Germany), v. 71, no. 10, 5 May 1980 p 658-665
(BLL-CTO-1941-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

Microcrystalline or amorphous layers were produced on metal surfaces by laser melting. Chromium steels were used as the substrate and the composition of the surface layer was varied by spraying with iron or iron boride. The structure of the laser melted layers and the influence of subsequent heat treatment were studied. Microhardness measurements were carried on the various phases. Author

N82-20291*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FRICTION AND WEAR OF IRON IN CORROSIVE METAL
George W. P. Rengstorff, Kazuhisa Miyoshi, and Donald H. Buckley Mar. 1982 18 p refs
(NASA-TP-1985; NAS 1.60:1985; E-638) Avail: NTIS HC A02/MF A01 CSCL 11F

Friction and wear experiments were conducted with elemental iron exposed to various corrosive media including two acids, base, and a salt. Studies involved various concentrations of nitric and sulfuric acids, sodium hydroxide, and sodium chloride. Load and reciprocating sliding speed were kept constant. With the base NaOH an increase in normality beyond 0.01 N resulted in a decrease in both friction and wear. X-ray photoelectron spectroscopy (XPS) analysis of the surface showed a decreasing concentration of ferric oxide (Fe2O3) on the iron surface with increasing NaOH concentration. With nitric acid (HNO3) friction decreased in solutions to 0.05 N, beyond which no further change in friction was observed. The concentration of Fe2O3 on the surface continued to increase with increasing normality. XPS analysis revealed the presence of sulfates in addition of Fe2O3

on surfaces exposed to sulfuric acid and iron chlorides but no sodium on surfaces exposed to NaCl. Author

N82-20292# Naval Ship Research and Development Center, Annapolis, Md. Ship Materials Engineering Dept.

CREVICE CORROSION BEHAVIOR OF 45 MOLYBDENUM-CONTAINING STAINLESS STEELS IN SEAWATER

Harvey P. Hack Dec. 1981 30 p refs
(SF6154191)
(AD-A109733; DTNSRDC/SME-81/87) Avail: NTIS HC A03/MF A01 CSCL 11/6

Thirty-six wrought and nine cast commercial molybdenum-containing stainless steels and nickel alloys were exposed to filtered natural seawater at 30 degree C for 30 days using multiple-crevice washers to create a crevice condition. The relative crevice corrosion behavior of these alloys in seawater is analyzed, and the effect of composition discussed. Author (GRA)

N82-20293# California Univ., Berkeley. Dept. of Materials Science and Engineering.

MICROSTRUCTURAL SOURCES OF TOUGHNESS IN QLT-TREATED 5.5 Ni CRYOGENIC STEEL

J. I. Kim, C. K. Syn, and J. W. Morris, Jr. Sep. 1981 39 p refs
(Contract N00014-75-C-0154)
(AD-A109616; TR-11) Avail: NTIS HC A03/MF A01 CSCL 11/6

In commercial practice 5.5 Ni steel is toughned for cryogenic service by a three-step heat treatment designated the 'QLT' treatment. To determine why this treatment is necessary and successful, a series of two-step heat treatments were applied to 5.5 Ni steel and the resulting microstructural states were characterized and compared with that resulting from the QLT treatment. It was concluded from this analysis that the QLT treatment lowers the ductile-brittle transition essentially be refining the grain size of the alloy through precipitation of thermally stable austenite in a dense distribution along the boundaries of prior martensite laths, hence destroying the crystallographic alignment of martensite packets and preventing cooperative cleavage. The multi-step heat treatment is necessary because of the low nickel content; a single step heat treatment leads to an austenite precipitate which is either too lean in solute to be retained or too coarse in its distribution to be effective. The problem is avoided in the QLT treatment since the L intercritical anneal serves to create regions of high solute content along the prior martensite lath boundaries, and the intercritical temper, T, then precipitates a dense distribution of high solute, stable austenite within these enriched regions.(Author) GRA

N82-20294# Lehigh Univ., Bethlehem, Pa. Center for Surface and Coatings Research.

CORROSION CONTROL THROUGH A BETTER UNDERSTANDING OF THE METALLIC SUBSTRATE/ORGANIC COATING/INTERFACE Annual Report, 1 Sep. 1980 - 31 Aug. 1981

Henry Leidheiser, Jr., Eugene M. Allen, Mohammed S. El-Aasser, Frederick M. Fowkes, Michael C. Hughes, John A. Manson, Fortunato J. Micale, David A. Thomas, Gary W. Simmons, and John W. Vanderhoff 1 Nov. 1981 221 p refs
(Contract N00014-79-C-0731)
(AD-A109606; AR-2) Avail: NTIS HC A10/MF A01 CSCL 11/3

This report presents the second annual summary of research carried out under Office of Naval Research Contract No. N00014-79-0731. The objective of the research is to obtain a better understanding of the metallic substrate/organic coating/interface system so that improvements may be made in corrosion control of metals by painting. The research during the past year has consisted of 15 different components directed by 10 Lehigh faculty members. These activities may be divided for convenience into those primarily concerned with (a) corrosion at the interface, (b) the chemistry of the metal/coating interface, (c) the properties of the coating, and (d) the surface properties of iron oxides from the standpoint of their presence at the steel/organic coating interface and their use as pigments. Author (GRA)

N82-20295# Lehigh Univ., Bethlehem, Pa. Dept. of Mechanical Engineering and Mechanics.

FRACTURE MECHANICS AND CORROSION FATIGUE

R. P. Wei and Gunchoo Shim Oct. 1981 34 p refs
(Contract N00014-75-C-0543; NR Proj. 036-097)
(AD-A109587; IFSM-81-109; TR-13) Avail: NTIS HC A03/MF A01 CSCL 11/6

The role of linear fracture mechanics in providing a quantitative framework for corrosion fatigue research and application is reviewed. The importance of integrating chemistry, mechanics and materials science in the development of quantitative mechanistic understanding of corrosion fatigue is emphasized, and is illustrated by results of studies of environmentally assisted fatigue crack growth in gaseous and aqueous environments. Author (GRA)

N82-20296# Naval Ship Research and Development Center, Annapolis, Md. Ship Materials Engineering Dept.

THE EFFECT OF FERROUS SULFATE ON SULFATE ON SULFIDE INDUCED CORROSION OF COPPER BASE CONDENSER ALLOYS IN AERATED SEAWATER

H. P. Hack and T. S. Lee Jan. 1982 25 p refs
(SF61541591)
(AD-A109812; DTNSRDC/SME-81/91) Avail: NTIS HC A02/MF A01 CSCL 11/6

Exposures were conducted for 30, 60, and 90 days in aerated seawater with and without continuous addition of 0.05 milligram per liter sulfide ion and 0.10 milligram per liter ferrous ions from ferrous sulfate on Alloys C70600 (90-10 copper-nickel), C71500 (70-30 copper-nickel), C72200 (85-15 copper-nickel plus chromium), and C68700 (aluminum brass). All alloys were susceptible to sulfide-induced corrosion. The ferrous sulfate was sufficient to completely counteract the sulfide-induced corrosion of all alloys except Alloy C72200. GRA

N82-20297# Bendix Corp., Kansas City, Mo.

DIRECT CURRENT SPUTTERED GOLD ON A BERYLLIUM COPPER ELECTRICAL CONNECTOR

G. J. Hale 1981 22 p refs
(Contract DE-AC04-76DP-00613)
(DE82-002688; BDX-613-2691) Avail: NTIS HC A02/MF A01

The use of a direct current (dc) sputter deposition process to coat a beryllium copper electrical connector used in a current viewing resistor (CVR) is described. The CVR connector was coated with gold by sputter deposition technique. The 8.8 mm long beryllium copper connector needed a gold thickness of 0.8 to 1.8 (SIGMA)m on most of its surface. A minimum 0.8 (SIGMA)m gold thickness inside a 0.57 mm hole at a 2 mm depth was also required. Three gold deposition cycles were nedded to achieve the desired thickness results. Special fixturing was used in each of the three deposition cycles to ensure that thickness requirements were met in the specified areas. Gold thickness is measured by cross sectioning sample units and is then measured by a filar microscope. DOE

N82-20298# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France).

EXPERIMENTAL AND THEORETICAL STUDY OF SOLID SOLUTION STABILITY UNDER IRRADIATION Ph.D. Thesis - Nancy Univ.

R. Cauvin Aug. 1981 216 p refs
(DE81-700666; CEA-R-5105) Avail: NTIS (US Sales Only) HC A10/MF A01; DOE Depository Libraries

The behavior of dilute alloys (Al-Zn, Al-Ag, Al-Si, Al-Ge and Al-Mg) under 1 MeV electron irradiation was studied in a high voltage electron microscope. A phenomenon of homogeneous precipitation induced irradiation in undersaturated solid solutions (Al-Zn, Al-Ag and Al-Si) was discovered: the observed precipitates are either coherent or incoherent, but never associated with point defect sinks. The solubility limit is a function of irradiation temperature and flux; but, under irradiation, it does not behave as a true thermal solubility limit. The irreversibility of the mutual recombination between trapped vacancies and mixed interstitials is shown to be the driving force of this homogeneous precipitation. A dilute solid solution model is used to show that, under irradiation, the homogeneous stationary state, stable from a strictly thermodynamic point of view, can be unstable when the recombination reaction is taken into account. The solubility limit

under irradiation is calculated with a nucleation-growth model taking account for this effect. DOE

N82-20299# Pratt and Whitney Aircraft Group, West Palm Beach, Fla. Research and Development Center.
INVESTIGATION OF VANADIUM AND HOT-CORROSION RESISTANCE OF CHROMIUM- AND SILICON-BASE COATING SYSTEMS
R. H. Barkalow and A. Kahn Apr. 1981 13 p
(Contract DE-AC06-79ET-15322)
(DE82-002449; DOE/ET-15322/T3; FR-14912) Avail: NTIS HC A02/MF A01

Turbine coating materials for resisting hot corrosion and ash erosion effects due to V, S, and alkali metals in residual oils, and coal derived fuels were examined. Furnace and burner rig tests were conducted to evaluate the performance of NiCrSi alloys, NiCrSi alloys containing additives, Cr base alloys, and Si-34Cr-23Ta in Na2S04, V205 and mixed salt hot corrosion. The compounds CoCrAly, Co-40Cr-8Si, and Cr-20Ni-5Mn-5Si were also evaluated. DOE

N82-20300# General Electric Co., Schenectady, N. Y. Energy Systems Programs Dept.
LONG TERM MATERIALS TEST PROGRAM: MATERIALS EVALUATION, IMPROVED SIMULATION TESTS
Sep. 1981 44 p refs
(Contract DE-AC21-79ET-15457)
(DE82-000649; DOE/ET-15457/182) Avail: NTIS HC A03/MF A01

The material screening tests performed in conjunction with the long term material test (LTMT) Program are summarized. Two types of screening tests under atmospheric pressure were performed; small burner rig tests and testing of airfoil shaped specimens in a high temperature, high velocity, erosion/corrosion simulator. Several protection systems were tested: CoCrAly and FeCrAly applied to IN-738 substrates by a physical vapor deposition (PVD) process, and M(Co, Fe)CrAly materials of similar composition applied to IN-738 by a glass-HIP cladding process. It is shown that the PVD (Co,Fe) CrAly alloys are more resistant and that the two cladding alloy compositions are most resistant to erosion/corrosion. The MCrAly materials which are completely adequate at lower velocity and fine particle loading, become highly susceptible to deterioration at high velocity and large particle erosion/corrosion conditions. DOE

N82-20301# Bendix Corp., Kansas City, Mo.
THIN-FILM HMC METALLIZATION PROCESSES Final Report
N. C. Thomas Oct. 1981 72 p refs
(Contract DE-AC04-76DP-00613)
(DE82-002432; BDX-613-2674) Avail: NTIS HC A04/MF A01

A thin film edge monitor pattern was developed to provide real-time, full process testing of thin film adhesion and electrical characteristics. An interface resistance test using the edge monitor pattern was developed to determine real-time aging characteristics of films subjected to elevated temperatures or corrosive environments. Mechanical and physical characteristics of thin film networks were correlated with electrical data. In addition, cleaning processes based on Freon TA and hydrogen peroxide were developed and are being used in production of thin film networks. DOE

N82-20302# California Univ., Berkeley. Lawrence Berkeley Lab. Dept. of Nuclear Engineering.
RADIATION ENHANCEMENT OF STRESS-CORROSION CRACKING OF ZIRCALOY Ph.D. Thesis
Shih-Hsiung Shann Sep. 1981 168 p refs
(Contract W-7405-eng-48)
(DE82-002691; LBL-13200) Avail: NTIS HC A08/MF A01

In order to examine the cause of the reactor fuel pin pellet-cladding interaction phenomenon, stress corrosion cracking experiments of Zircaloy under iodine, iron iodide, aluminum iodide, cesium iodide, and cadmium were undertaken. Radiation enhancement tests with CsI were also performed. Iodine, iron iodide, and aluminum iodide can reduce the failure times. Fractography is of cleavage type and is completely different from the ductile dimple type failure for control specimens. There exists a critical stress of 379 MPa for iodine and iron iodide above which burst type failure occurs. Pinhole type failure predominates for lower stresses. Both types showed brittle fracture surfaces. Th presence of CsI did not have any influence on failure time of zircaloy. The failure is burst type, and the fractography is ductile. Radiation enhancement tests with cesium iodide did not cause reduction in failure time either. Failure times were decreased for the tests under cadmium. All specimens failed under cadmium vapor by a burst mode, and fractography showed cleavage brittle characteristics. DOE

N82-20303 Illinois Univ. at Urbana-Champaign.
THE PREMARTENSITIC TRANSITIONS OF TITANIUM NICKEL: OBSERVATION OF A CHARGE DENSITY WAVE IN A BINARY ALLOY Ph.D. Thesis
Michael Eric Meichle 1981 212 p
Avail: Univ. Microfilms Order No. 8127643

The appearance of a charge density wave and associated phase transitions were identified in TiNi(Fe), a binary alloy. Bulk thermal and transport measurements revealed that the 'pre-martensitic instability' is composed of two distinct phase transitions. In TiNi(3.2% Fe), these occur at 232 K and 224 K. The Fe impurities are added to produce a large temperature separation between these transitions and the martensitic transformation. Elastic neutron diffraction and X-ray diffraction measurements show that the 232 K transition is associated with the appearance of incommensurate 1/3(1-d)(110) and 1/3(102d)(111) superlattices with d approximately .005 at the onset. The displacements of the 1/3(110) and 1/3(111) superlattices are transversely and longitudinally polarized, respectively. This transition is second order and is associated with a discontinuous change in the slope of the magnetic susceptibility. At 224 K, the lattice undergoes a sudden rhombohedral distortion which makes the lattice and superstructure commensurate.
Dissert. Abstr.

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N82-20304 Stanford Univ., Calif.
ELECTRICAL AND MICROSTRUCTURAL CHARACTERIZATION OF STABILIZED ZIRCONIA SOLID ELECTROLYTES Ph.D. Thesis
Farhad Kermani Moghadam 1981 352 p
Avail: Univ. Microfilms Order No. 8124109

The influence of the preparation and thermal history on the properties of yttria stabilized zirconia (YSZ) electrolyte samples was studied. The scope of the study included complex admittance analysis of as-received and annealed samples under a variety of conditions and microstructural observations of these samples using scanning and transmission electron microscopy. The ac electrical conductivity was investigated for different yttria-stabilized zirconia using porous Pt-paste electrodes and for temperatures in the range of 400 to 1000 C and ambient atmosphere of air. The change of conductivity upon aging of YSZ electrolytes was investigated for annealing temperatures of 800 C, 900 C, and 1000 C. The influence of grain size impurity content, stabilizer composition, and surrounding atmosphere on the aging kinetics of YSZ electrolytes was also investigated. Dissert. Abstr.

N82-20305 Michigan Univ., Ann Arbor.
THE INFLUENCE OF REACTIVE ION-PLATED OXIDES ON PORCELAIN-METAL BONDING Ph.D. Thesis
Lawrence Frederick Allard, Jr. 1981 178 p
Avail: Univ. Microfilms Order No. 8125057

The technique of reactive ion plating was developed in a small scale laboratory application for the production of oxide films onto base-metal alloy substrates. Films of amorphous Al2O3 and SnO2 were deposited onto the base metal using this technique to study the influence of these oxides on the strength of the bond between dental porcelain and the base metal alloy. The Al2O3 films showed a strong positive influence on bond strength, while the SnO2 films showed only marginal improvement of

bond strength, when compared to porcelain fired directly onto an uncoated alloy surface. The Al2O3 coated samples fractured at the alloy-plated layer interface, with the Al2O3 layer remaining intact and strongly bonded to the porcelain. The fracture propagated through a reaction layer of oxides of Mn and Cr. The SnO2 coated samples fractured between the alloy surface and a layer of oxides rich in Al, Mn and Cr which were non-adherent to the alloy. The SnO2 film dissolved into the porcelain and did not protect the alloy from forming these non-adherent oxides. Dissert. Abstr.

N82-20306 Michigan Univ., Ann Arbor.
PLASTIC DEFORMATION OF POLYETHYLENE Ph.D. Thesis
Stephen James Krause 1981 105 p
Avail: Univ. Microfilms Order No. 8125147

The effect of strain geometry and degree of strain on the texture development and plastic stress-strain relationship of high density polyethylene was studied at room temperature. Crystallite orientation distributions in rolling textures were quantified with an efficient new technique which fits three-parameter, two-dimensional Gaussian distributions to pole intensity data around ideal texture component orientations. At high strains, where texture is most fully developed, the flow stress is highest for plane-strain compression, intermediate for uniaxial compression, and lowest for uniaxial tension. This is because well aligned crystallites are strongly inhibited from elongating by twinning or slip in plane strain, whereas in uniaxial compression mechanisms involving shear perpendicular to the c-axis, such as (100) [010] slip, can still contribute to thinning. In uniaxial tension the absence of any frictional effects and the hydrostatic tensile stress reduce the flow stress. Dissert. Abstr.

N82-20307 Rensselaer Polytechnic Inst., Troy, N. Y.
CHEMICAL DURABILITY OF SILICATE GLASSES Ph.D. Thesis
Yogesh Mehrotra 1981 225 p
Avail: Univ. Microfilms Order No. 8121156

The nature and the mechanism of the reaction of silicate glass with aqueous environments, and the kinetics of this interaction are reported. Four silicate glasses were studied by leaching, chemical etching, Rutherford-backscattering-Spectroscopy (RBS), Nuclear-Reaction-Analysis (NRA), infrared spectroscopy and electrical conductivity techniques. It was found from etching experiments and wet chemical analysis that silicon reaches its bulk concentration at or very near the glass surface. Dissert. Abstr.

N82-20308 Minnesota Univ., Minneapolis.
MATERIALS ANALYSIS AND CONDENSATION MECHANICS OF ARC PLASMA PROCESSED REFRACTORY COMPOUNDS Ph.D. Thesis
Paul Andrew Ronsheim 1981 215 p
Avail: Univ. Microfilms Order No. 8126009

A wall stabilized arc plasma argon jet is used to vaporize and react injected transition metal powders with graphite, methane or nitrogen. Reactor characterization is pursued with X-ray diffraction analysis and electron microscopy. The high temperatures (10,000 K) and rapid quench (1 million deg/sec) of the vaporized material result in the formation of high temperature phases of refractory compounds. The stoichiometry of these plasma processed materials is investigated. Of particular interest are the Group Vb metal nitrides. The composition of these B1 superconductors depends on the nitrogen content of the plasma. Delta VN(x) is formed over a range of 0.85 < by < 1.02 delta-NbN (0.84) (a(o) = 4.37A and delta-TaN(x) (a(o) = 4.315A to 4.387A) are also produced. Practical applications of thermal plasma processing require product particle size control. Factors which influence the particle sizes are determined, and include vapor phase concentration of the reacting material and the quench rate. Author

N82-20309 Illinois Univ. at Urbana-Champaign.
CHARACTERIZATION OF INTERNAL BOUNDARY LAYER CAPACITORS BASED UPON BARIUM TITANATE AND STRONTIUM TITANATE Ph.D. Thesis
Hyun Duk Park 1981 103 p
Avail: Univ. Microfilms Order No. 8127662

The properties of polycrystalline electrical ceramics are greatly influenced by the electrical and mechanical boundary conditions existing at grain and phase boundaries. The dielectric properties of internal boundary layer capacitor are directly related to their microsctructure, in which semiconducting grains are surrounded by continuously connected thin insulating boundaries. The nature of ceramic microstructure and the electrical properties of individual grains and junctions was determined by STEM, microprobe analysis and microscale electrical measurements. The chemical compositions of the resistive boundary regions were different from those of the grains. Additives were concentrated in the boundary regions, forming resistive layers. Limited diffusion of the counterdopants into the grain surface formed an interfacial compensation layer between the insulating integranular layer and the semiconducting grains. The electrical behavior of this intermediate layer was found to be similar to that of a depletion layer. Dissert. Abstr.

N82-20310 New Hampshire Univ., Durham.
DIFFUSION CONTROLLED VINYL POLYMERIZATION Ph.D. Thesis
Sung Kuk Soh 1981 254 p
Avail: Univ. Microfilms Order No. 8129271

A method of handling polymerization kinetics with the chain length dependence termination reaction is proposed, which is largely independent of the form of the chain length dependency and is capable of dealing with both disproportionation and recombination modes of termination with chain transfer reaction to monomer. The vinyl polymerization kinetics is modelled for each of the four distinct phases which show different polymerization kinetics physical property interactions. The polymerization kinetics conforms to the conventional kinetics and the molecular weight distribution to the Schulz-Flory most probable distribution. The termination reaction is controlled by the translational diffusion of the macroradicals. The polymerization kinetics begin to deviate from the conventional kinetics and the termination reaction rate constant shows chain length dependence and conversion dependence. Dissert. Abstr.

N82-20311 British Library Lending Div., Boston Spa (England).
THE BEHAVIOR OF LOW-PRESURE POLYETHYLENE UNDER THE EFFECT OF IONIZING RAYS
H. Wilski 29 Oct. 1981 11 p Transl. into ENGLISH from German report
(BLL-WH-490-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

The influence of dose and dose rate in the irradiation of low-pressure polyethylene in air was examined. An explanation of the changes in mechanical properties was found. Results of mechanical tests on low-pressure polyethylene products included information on: irradiation conditions for stretched wires; viscosity measurements and molecular weights; shrinkage, and radiation decomposition. M.D.K.

N82-20312 British Library Lending Div., Boston Spa (England).
THE BEHAVIOUR OF PLASTICS UNDER RADIATION
H. Wilski 29 Oct. 1981 12 p refs Transl. into ENGLISH from Atonwirtschaft (West Germany), Feb. 1965
(BLL-Trans-WH-494(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

Adequate radiation resistance is the most important requirement for the application of plastics under radiation stresses. Investigations of testing for radiation resistance and the critical evaluation of the results obtained show that short-term experiments at high dose-rates with the specimens packed air-tight provide, in general, no hypotheses as to the behaviour after uptake of the same dose in a year-long irradiation in air. The deleterious effect is a function not only of the dose but also to a high degree of the dose-rate. Author

N82-20313*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IMPROVED BOUNDARY LUBRICATION WITH FORMULATED C-ETHERS
William R. Loomis 1982 25 p refs Proposed for presentation at the 37th Ann. Meeting of the Am. Soc. of Lubrication Engr., Cincinnati, 10-13 May 1982
(NASA-TM-82808; E-1149; NAS 1.15:82808) Avail: NTIS

HC A02/MF A01 CSCL 07C

A comparison of five recently developed C-ether-formulated fluids with an advanced formulated MIL-L-27502 candidate ester is described. Steady state wear and friction measurements were made with a sliding pin on disk friction apparatus. Conditions included disk temperatures up to 260 C, dry air test atmosphere, 1 kilogram load, 50 rpm disk speed, and test times to 130 minutes. Based on wear rates and coefficients of friction, three of the C-ether formulations as well as the C-ether base fluid gave better boundary lubrication than the ester fluid under all test conditions. The susceptibility of C-ethers to selective additive treatment (phosphinic esters or acids and other antiwear additives) was demonstrated when two of the formulations gave somewhat improved lubrication over the base fluid. The increased operating potential for this fluid was shown in relationship to bulk oil temperature limits for MIL-L-23699 and MIL-L-27502 type esters. Author

N82-20314*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

SPUTTERED SILICON NITRIDE COATINGS FOR WEAR PROTECTION

Alfred Grill (Ben Gurion Univ.) and Paul R. Aron 1982 10 p refs Presented at the Intern. Conf. on Met. Coatings and Process Technol., San Diego, Calif., 4-9 Apr. 1982

(NASA-TM-82819; E-1143; NAS 1.15:82819) Avail: NTIS HC A02/MF A01 CSCL 07D

Silicon nitride films were deposited by RF sputtering on 304 stainless steel substrates in a planar RF sputtering apparatus. The sputtering was performed from a Si_3N_4 target in a sputtering atmosphere of argon and nitrogen. The rate of deposition, the composition of the coatings, the surface microhardness and the adhesion of the coatings to the substrates were investigated as a function of the process parameters, such as: substrate target distance, fraction nitrogen in the sputtering atmosphere and sputtering pressure. Silicon rich coating was obtained for fraction nitrogen below 0.2. The rate of deposition decreases continuously with increasing fraction nitrogen and decreasing sputtering pressure. It was found that the adherence of the coatings improves with decreasing sputtering pressure, almost independently of their composition. Author

N82-20315# National Inst. for Transport and Road Research, Pretoria (South Africa).

THE DEVELOPMENT OF PVC-MODIFIED TARS FOR USE IN SURFACE TREATMENTS

I. L. Jamieson 1981 75 p refs

(CSIR-RR-393; CSIR-B-14) Avail: NTIS HC A04/MF A01

An account of this research in improving the durability of tar is presented. It includes: the formulation of tars; the manufacture of tars and modified tars; the storage and handling of tars; the performance of PVC modified tars in surface treatments, road experiments and normal contract work. The development of improved tar binders which could be used as alternatives to petroleum bitumen, with considerable cost advantage to road authorities was considered. Practical points which have emerged from this research are included. Author

N82-20316*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

INFLUENCE OF MINERAL OIL AND ADDITIVES ON MICROHARDNESS AND SURFACE CHEMISTRY OF MAGNESIUM OXIDE (001) SURFACE

Kazuhisa Miyoshi, Hiroyuki Shigaki, and Donald H. Buckley Mar. 1982 11 p refs

(NASA-TP-1986; E-975; NAS 1.60:1986) Avail: NTIS HC A02/MF A01 CSCL 11H

X-ray photoelectron spectroscopy analyses and hardness experiments were conducted with cleaved magnesium oxide /001/ surfaces. The magnesium oxide bulk crystals were cleaved into specimens along the /001/ surface, and indentations were made on the cleaved surface in laboratory air, in nitrogen gas, or in degassed mineral oil with and without an additive while not exposing specimen surface to any other environment. The various additives examined contained sulfur, phosphorus, chlorine, or oleic acid. The sulfur-containing additive exhibited the highest hardness and smallest dislocation patterns evidencing plastic deformation; the chlorine-containing additive exhibited the lowest hardness and largest dislocation patterns evidencing plastic deformation. Hydrocarbon and chloride ($MgCl_2$) films formed on the magnesium oxide surface. A chloride film was responsible for the lowest measured hardness. Author

N82-20317# Naval Research Lab., Washington, D. C. Underwater Sound Reference Detachment.

A TECHNIQUE TO MEASURE THE VOLUME OF ELASTOMERS AS A FUNCTION OF TEMPERATURE AND PRESSURE WITH AN ACOUSTIC PYCNOMETER Interim Report

Erik K. Holmstrom and Anthony J. Rudgers 28 Dec. 1981 106 p refs

(RR0110842)

(AD-A109830; NRL-MR-4584) Avail: NTIS HC A06/MF A01 CSCL 14/2

A technique to determine the volume of elastomer samples as a function of temperature and pressure is described. The volume of butyl-252 elastomer sample was measured with an acoustic pycnometer at temperatures of 10 C and 25 C over the pressure range from 2 MPa to 70 MPa with an accuracy of better than 0.3 percent. A calibration method was used to enhance the low-pressure range of the acoustic pycnometer. A theory was developed for this calibration procedure. From the volume vs. pressure measurements, the isothermal bulk modulus was calculated at 10 C and 25 C for the butyl-252 sample. The volume of a type-W neoprene elastomer sample was also measured at 25 C over the indicated pressure range. GRA

N82-20318# Office of Naval Research, London (England).

POLYMER AND SURFACE SCIENCE IN EUROPE, ISRAEL AND EGYPT: SOME OBSERVATIONS

W. D. Bascom 25 Nov. 1981 14 p

(AD-A109859; ONRL-R-6-81) Avail: NTIS HC A02/MF A01 CSCL 11/9

This report contains the author's observations relating to polymer and surface science research activities in European and Middle Eastern countries with emphasis on the quality and quantity of research and the directions research efforts are taking. The information was obtained in visits to university and industrial laboratories and government research organizations over a period of 21 months. Author (GRA)

N82-20319# Ceramic Finishing Co., State College, Pa.

FRACTOGRAPHIC INVESTIGATION OF MICROMECHANISMS OF FRACTURE IN ALUMINA CERAMICS Summary Report, 24 Apr. 1979 - 24 Mar. 1981

Henry P. Kirchner, Robert M. Gruver, and John A. Ragosta 31 Nov. 1981 152 p refs

(Contract N00019-79-C-0528)

(AD-A109819) Avail: NTIS HC A08/MF A01 CSCL 11/2

Variations in the fracture features along radii from fracture origins in alumina ceramics were characterized and compared at equal values of stress intensity factor. The flaws at fracture origins, flaw linking, fraction of intergranular and transgranular fracture; linear features such as cleavage steps, surface roughness profiles, and crack branching were investigated for specimens fractured at various stresses and in selected environments using multiple techniques such as SEM, TEM, selected area electron channeling, and computerized surface roughness analysis. In alumina ceramics subcritical crack growth occurs mainly by wavy transgranular fracture which gives rise to the so called reflecting spots that surround the fracture origin. The subcritical crack growth boundaries are characterized by minima in the percent intergranular fracture and scattered pullouts and projecting grains. Effects of environment on the fracture mode were investigated in specimens from strength measurements and work of fracture tests. Present evidence indicates that the presence of water in the environment enhances transgranular fracture. GRA

N82-20320# Massachusetts Univ., Amherst. Dept. of Polymer Science and Engineering.

THE EFFECT OF ANHYDROUS AMMONIA ON THE CRYSTALLINE STATE DEFORMATION OF NYLONS 6 AND 6,6 Interim Report

Tetsuo Kanamoto (Science Univ. of Tokyo), Anagnostis E. Zachariades (IBM, San Jose, Calif.), and Roger S. Porter 14 Sep. 1981 38 p refs

(Contract N00014-75-C-0686; NR Proj. 356-584)
(AD-A109582; TR-15) Avail: NTIS HC A03/MF A01 CSCL 11/9

The aliphatic polyamides Nylon-6 and -6,6 have been cold drawn using the new concept of reversible plasticization NH3. Two aspects were investigated: The effect of NH3 plasticization on the stress-strain behavior of nylon 6,6 and the extent of NH3 absorption studied by X-ray analysis and reported for the structurally simpler nylon 6. X-ray analysis shows that ammonia is absorbed preferentially by the amorphous phase and that the plasticization has a significant effect on the mode of crystal unit cell orientation, the small angle void scattering and the interplanar spacings between sheets of hydrogen bonded chains. The effect of plasticization was documented by the lower yield stress, the higher draw ratio (8x) and tensile modulus (10 GPa) not attainable with unplasticized specimens. GRA

N82-20321# Massachusetts Univ., Amherst. Dept. of Polymer Science and Engineering.
FRACTURE AND INTERFACE STUDIES OF ARAMID REINFORCED POLYAMIDE COMPOSITES: COMPRESSIVE EFFECTS AND CRITICAL LENGTH MEASUREMENTS Interim Report
Steven J. DeTeresa, Richard J. Farris, and Roger S. Porter 20 Oct. 1981 25 p refs
(Contract N00014-75-C-0686)
(AD-A109506; TR-16) Avail: NTIS HC A02/MF A01 CSCL 11/9

An investigation of interfacial properties and fiber compression in a class of composites utilizing polymer reinforcement of a polymer matrix was carried out. A model system incorporating single filaments of Kevlar-49 fiber in a nylon-6 matrix was prepared by solution casting the matrix around the fiber. Compression of the fiber caused by shrinkage during the casting process resulted in a fiber surface failure with the formation of kinks at approximately 45 deg to the fiber axis. Tensile testing of the compressed fibers revealed a decrease in initial tensile modulus and a about 20% reduction in strength at break. Measured fiber critical lengths fell within the theoretical range in almost every case. Relative changes in fragment length distributions occurred toward smaller critical lengths with exposure of the model composite to water. This suggests an increase in the apparent interfacial shear strength in the presence of water. An explanation for this behavior in terms of variable interfacial shear strength and ultimate fiber strength is proposed. The sensitivity of the properties of the highly anisotropic aramid fiber to composite dimensional changes is realized in both mechanical tests on the bare fiber and critical length measurements. Author (GRA)

N82-20322# Army Construction Engineering Research Lab., Champaign, Ill.
EVALUATION OF SPRAYED POLYURETHANE FOAM ROOFING AND PROTECTIVE COATINGS Final Report
Myer J. Rosenfield Nov. 1981 58 p refs
(AD-A109696; CERL-TR-M-297) Avail: NTIS HC A04/MF A01 CSCL 11/9

This report documents a study to evaluate sprayed polyurethane foam (PUF) roofing and protective coatings for use in reroofing at Army installations. Manufacturers, field applications, and literature were surveyed to identify advantages and disadvantages associated with the use of these systems. It was found that the service life of this type of roof system depends on the skill of the applicator and the capability of the coating material to resist the effects of climate and weather. PUF can be used as an alternative to conventional built-up roofing (BUR) for new roofs, or to replace failed roofs. However, because these systems are relatively new (and long-term durability statistics are not available), they should only be used on carefully selected Army roofs. New construction is limited to the use of silicone-coated PUF over concrete roof decks, as required by Corps of Engineers Guide Specification (CEGS)-07540. Author (GRA)

N82-20323# Bendix Corp., Kansas City, Mo.
SHELF LIFE DETERMINATION OF AN EPOXY RESIN BY ACCELERATED AGING Final Report
H. M. Smith, A. V. May, and C. L. Long Sep. 1981 46 p refs
(Contract DE-AC04-76DP-00613)
(DE82-000821; BDX-613-2643) Avail: NTIS HC A03/MF A01

The aging characteristics of GE-100, a German manufactured equivalent of Epon 812 epoxy resin, were determined by an accelerated aging study. The changes induced in the GE-100 by thermal aging were observed at five elevated temperatures over a period of three months. Analysis of the data permitted a prediction of the changes expected during shelf storage of the resin at 4.4 and 250 C. Test samples of Ablefoam Number 5, prepared from GE-100 resin thermally aged the equivalent of 11.5 years at 4.4 and at 250 C, met all requirements. Results indicate that the GE-100 resin has a shelf-life exceeding 11 years at cold storage and ambient conditions. DOE

N82-20324 Louisville Univ., Ky.
APPLICATION OF ADVANCED PROCESS CONTROL TECHNIQUES TO CONTINUOUS EMULSION POLYMERIZATION Ph.D. Thesis
Kenneth Wayne Leffew 1981 333 p
Avail: Univ. Microfilms Order No. 8129577

A mechanistic model of continuous emulsion polymerization in a train of tank reactors was developed. This model was incorporated into an analytical predictor algorithm which successfully compensates for process deadtime in conversion control of front-end reactors. Regulatory and servo control of conversion from the first reactor were significantly improved in both simulations of the vinyl acetate system and in an implemented commercial system. Reactor design modifications were suggested by experimental and simulation studies which allowed the controlled operation of a train of reactors using a 'soap-starved' feed. Additionally, a control system was developed for conversion control of downstream reactors using z-transform design methods. On-line model parameters estimation techniques were incorporated to achieve adaptive control. Also, a decoupler network was defined to eliminate interaction between conversion and reaction temperature control loops. The control techniques developed were evaluated by simulation o the vinyl acetate system, for which the mechanistic model was previously tested. In addition, these control strategies were implemented successfully on an existing commercial facility to provide improved control of the process. Dissert. Abstr.

N82-20325 Texas A&M Univ., College Station.
THE STRUCTURE OF WATER ADSORBED IN POLYMERS Ph.D. Thesis
Don Alan Kinard 1981 111 p
Avail: Univ. Microfilms Order No. 8128903

Since water is dielectrically active its mobility can be studied as a function of temperature, frequency, salt concentration, and water content in an alternating electric field. Results show a wide distribution of relaxation times for the water molecules; this can be explained by assuming many different cluster sizes for the water molecules each with its characteristic relaxation time. As the temperature is lowered the molecules of water become sluggish and finally stop moving; this can be seen as constant value of the dielectric loss after 150 K. Differential scanning calorimetry allows a direct measurement of the heat capacity of the water adsorbed on polymers and thus information on the nature of the water. From 90 K to 150 K the water has a heat capacity equal to that of ice; above 150 K the heat capacity increases linearly to a value of 1.2 cal/K gm at room temperature. This change at 150 K indicates an onset of mobility. Dissert. Abstr.

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N82-20326*# Hufferd (W. L.) and Associates, Salt Lake City, Utah.
DYNAMIC CHARACTERIZATION AND ANALYSIS OF SPACE SHUTTLE SRM SOLID PROPELLANT Final Report

William L. Hufferd Apr. 1979 216 p refs
(Contract NAS8-32234)
(NASA-CR-161227; NAS 1.26:161227) Avail: NTIS HC A10/MF A01 CSCL 21I

The dynamic response properties of the space shuttle solid rocket motor (TP-H1148) propellant were characterized and the expected limits of propellant variability were established. Dynamic shear modulus tests conducted on six production batches of TP-H1148 at various static and dynamic strain levels over the temperature range from 40 F to 90 F. A heat conduction analysis and dynamic response analysis of the space shuttle solid rocket motor (SRM) were also conducted. The dynamic test results show significant dependence on static and dynamic strain levels and considerable batch-to-batch and within-batch variability. However, the results of the SRM dynamic response analyses clearly demonstrate that the stiffness of the propellant has no consequential on the overall SRM dynamic response. Only the mass of the propellant needs to be considered in the dynamic analysis of the space shuttle SRM. R.J.F.

N82-20327# Committee on Science and Technology (U. S. House).
SYNTHETIC FUELS DEVELOPMENT
Washington GPO 1981 118 p Hearing before the Subcom. on Energy Development and Applications and the Subcomm. on Investigations and Oversight of the Comm. on Sci. and Technol., 97th Congr. 1st Sess., No. 33, 27 Jul 1981
(GPO-85-050) Avail: Subcomm. on Energy Development and Applications

Recent developments in synthetic fuels technology are discussed, particularly in the areas of coal gasification, coal liquefaction, shale oil extraction, and alcohol fuel development. Government-industry cooperation is discussed. The problems of synfuel development are evaluated in the context of the U.S. dependence on imported oils. Synfuel production costs are examined. R.J.F.

N82-20328# Committee on Governmental Affairs (U. S. Senate).
INTERNATIONAL ALCOHOL FUELS
Washington GPO 1981 383 p Hearing before the Subcomm. on Energy, Nuclear Proliferation, and Govt. Processes of the Comm. on Governmental Affairs, 97th Congr., 1st Sess., 24 Mar. 1981
(GPO-78-681) Avail: Subcomm. on Energy Nuclear Proliferation, and Govt. Processes

The production of alcohol fuels and other nonpetroleum-based liquid fuels is discussed in the context of problems caused by U.S. dependence upon imported petroleum fuels. Biomass energy production and coal liquefaction are considered. Gasohol production and utilization are emphasized. Economic factors influencing private investments in alternative energy enterprises are discussed. The impact of increased alcohol fuel production on agriculture is considered. R.J.F.

N82-20329# Committee on Science and Technology (U. S. House).
THE NATURAL GAS OPTION: NEW RESOURCES AND NEW TECHNOLOGIES
Washington GPO 1981 176 p Hearing before the Subcomm. on Energy Development and Applications of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 28, 22 Jul. 1981
(GPO-85-052) Avail: Subcomm. on Energy Development and Applications

The ability of the gas industry to develop new technology for gas production and efficient gas use is examined. Synfuel/production coal gasification, coal liquefaction, and other alternative fuel technologies are discussed. The gas energy supply outlook for 1980 to 2000 is discussed. R.J.F.

N82-20330# Materials Research Labs., Ascot Vale (Australia).
MODIFICATION OF THE TECHNIQUE FOR THE MECHANICAL POLISHING OF CAST TNT COMPOSITIONS
M. A. Parry Sep. 1981 15 p refs
(AD-A109425; MRL-TN-456) Avail: NTIS HC A02/MF A01 CSCL 19/1

Previous work at MRL established a technique for the mechanical polishing of specimens of cast TNT compositions. Due to the unavailability of materials used in the technique, modifications were made which maintained the high quality finish observed previously. Author (GRA)

N82-20331# Hercules, Inc., Radford, Va. Ammunition Plant.
TNT PURIFICATION STUDIES Final Report
R. A. Mundy, J. R. Spencer, and E. E. Gilbert Dover, N.J. Army Armament Research and Development Command Dec. 1981 42 p ref
(Contract DAAA09-77-C-4007)
(AD-A109719; AD-E400746; ARLCD-CR-81052) Avail: NTIS HC A03/MF A01 CSCL 19/1

This report describes laboratory studies of the purification of crude 2,4,6-trinitrotoluene (TNT) using ammonium sulfite and magnesium sulfite hexahydrate. The magnesium sulfite hexahydrate purification process produces acceptable TNT, but the TNT produced using ammonium sulfite has low set points. From laboratory studies, the red water resulting from the purification of TNT using magnesium sulfite hexahydrate can be easily concentrated and the magnesium sulfite hexahydrate recovered for recycling into the TNT purification system. GRA

N82-20332# SRI International Corp., Menlo Park, Calif.
FEASIBILITY STUDY ON NEW PROCESSES FOR FUEL FROM BIOMASS Summary Report, 1 Jun. 1979 - 31 Jan. 1981
D. Z. Rogers, Donald J. Wilhelm, and David S. Ross Jan. 1981 94 p refs Prepared for Pacific Northwest Lab.
(Contract DE-AC03-79ET-23023; SRI Proj. PYU-8616)
(DE82-002834; DOE/ET-23023/T4) Avail: NTIS HC A05/MF A01

The technical and economic feasibility of producing liquid fuels from biomass by two types of proposed processes, peroxidic conversion and catalyzed direct liquefaction in a carbon monoxide/steam system was studied. The work was divided into three tasks: peroxidic conversion; novel acid/base systems; and economic evaluations. The plant capacity and design and economic bases were chosen to facilitate comparison with the LBL and PERC process concepts previously evaluated for DOE by SRI. This evaluation was cast in the same light as SRI's recent evaluation for DOE of the Albany liquefaction program. The product still appears to be a crude, complex, viscous, and troublesome material that could not be marketed, even as a low-grade fuel, because it is too costly and not an economical chemical feedstock. Catalytic direct biomass liquefaction still appears to offer little potential for commercialization. Economically feasible direct biomass liquefaction will require significant breakthrough in catalyst technology. Implications for research aimed at improving the liquefaction data base and the understanding of possible liquefaction processes are also discussed. GRA

N82-20333# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
METHANE UTILIZATION FROM COALBEDS FOR POWER GENERATION AT BETHLEHEM MINES CORPORATION MARIANNA MINE NO. 58 Final Report
May 1981 215 p refs
(Contract DE-AC21-77ET-13133)
(DE81-029791; AESD-TME-3065) Avail: NTIS HC A02/MF A01

During one process of mining coal, methane is removed from the coal seam before the coal is mined. This methane is collected underground, piped to the surface, and exhausted to the atmosphere as a waste by-product of the mining process. An electrical power generation system was assembled to demonstrate utilization of this energy source. An 800 kW gas turbine generator with attendant compression and electrical equipment converted 200,000 standard cubic feet per day of methane to about 250 kWh. This electrical power was utilized by a mine surface load consisting of a 100 hp air compressor and a 300 hp mine ventilation fan. Power generated represented about 25% of the total energy used in all the mine ventilation systems or about 5% of the total underground mine electrical requirements. The main conclusions of the work performed is that low Btu gob gas in the range of 100 to 400 Btu/ft(3) can be combusted successfully in a diffusion flame system. The efficiencies that can be achieved are high and in general stability is adequate. Both the efficiency and stability range achieved were sufficient to indicate that a gas turbine could be operated

with such fuels over a normal operating cycle. One problem that was noticed during earlier investigations is that because of the low energy content of the fuel, heat losses in the combustor can significantly affect performance, particularly stability. In general such combustion systems should be maintained as near adiabatic as possible and should operate with as high a wall temperature as is possible. Further research and development will be required of any scaled combustion system before it could be considered a suitable candidate for engine installation. S.L.

N82-20334# West Virginia Univ., Morgantown. Dept. of Chemical Engineering.
ROLE OF C-CO2 IN GASIFICATION OF COAL AND CHAR Quarterly Report, 1 Jan. - 31 Mar. 1981
J. T. Sears and C. Y. Wen 1981 16 p refs
(Contract DE-AC21-78ET-11338)
(DE81-027358; DOE/ET-11338/T1) Avail: NTIS HC A02/MF A01

The high-temperature TGA has been operated with steam and CO2 for lignite and bituminous chars. Problems with temperature calibration require varification of results before further analysis. Work on attrition of coal in a pressurized, sand fluid-bed was completed. Conditions were 5-45 cm/sec at 1 to 7 atm total pressure. The rate obtained increases with fluidizing velocity and pressure. The rate constants are negligible at velocities below approx. = 30 cm/sec for particles 60 to 175 (SIGMA) in diameter. Results appear to be dependent on change in hydrodynamics with pressure. A hot-bed fluidization system was commissioned and operated. Entrainment/elutriation data for coal particles was obtained in the range 5 to 90 cm/sec at 800 to 9000C for a 12.7 cm sand bed. DOE

N82-20335# Battelle Columbus Labs., Ohio.
SYNTHETIC-FUEL AROMATICITY AND STAGED COMBUSTION Quarterly Technical Progress Report, 1 Jul. - 30 Sep. 1981
Arthur Levy, James R. Longanbach, and Lisa K. Chan 31 Oct. 1981 24 p
(Contract DE-AC22-89PC-30302)
(DE82-002453; DOE/PC-30302/4) Avail: NTIS HC A02/MF A01

Synthetic liquid fuels, synfuels or coal-derived liquids were characterized from a combustion-environmental point of view. Two critical problems, NO/sub x/ formation and soot formation, were studied. Pyrolysis of SCRII cuts in helium resulted in increasing aromatization as the temperature was increased. This occurred with substantial losses of hydrogen, although the amount of aromatic hydrogen per molecule increased. The slight decrease in carbon content and loss of hydrogen were balanced by a relative increase in heteroatom content, presumably oxygen. This resulted in large concentrations of unsubstituted aromatics n the stable liquid products. These were presumed to be soot precursors in staged combustion. Nonbasic nitrogen, primarily pyroles, were found to increase during pyrolysis, while basic nitrogen, primarily pyridine analogs, decreased. Thus, nonbasic nitrogen compounds could be the principal precursors of NO/sub x/ during staged combustion of synthetic coal derived fuels. When substoichiometric amounts of oxygen were added to the system, aromaticity increased. M.D.K.

N82-20336# Dravo Corp., Pittsburgh, Pa.
FEASIBILITY STUDY FOR THE PRODUCTION OF LOW/MEDIUM-Btu GAS FROM COAL FOR TRI-CITY REGIONAL PORT DISTRICT GRANITE CITY, ILLINOIS
Feb. 1981 313 p
(Contract DE-FG01-80RA-50137)
(DE82-002881; DOE/RA-50137/1) Avail: NTIS HC A14/MF A01

The technical specifications for, and the economic feasibility of a wide variety of coal gasification facilities to meet the needs of an industrial park are described. The gasification facility is aimed at making the industrial sites energy independent. Three cases were studied, and the results of each are presented. The cost of gas for each case was determined both at the facility, and as delivered. The projected fuel cost for coal gas in the minimum capacity plant is considerably less than the cost for fuel oil. DOE

N82-20337 Michigan State Univ., East Lansing.
ETHANOL FUEL FOR DIESEL TRACTORS Ph.D. Thesis
Jose Marcio DaCruz 1981 210 p
Avail: Univ. Microfilms Order No. 8126490

The use of ethanol in turbocharged diesel tractors is considered to evaluate the conversion of a diesel tractor for dual-fueling with ethanol by attaching a carburetor to the inlet air system or with the use of an alcohol spray-injection kit. The spray-injection approach consisted of a fuel tank, an air supply line, an orifice, a fuel filter, an instrument panel, and the necessary valves and fittings. Different water-ethanol mixtures were used in the tests. For the spray-injection approach, the mixtures and also distilled water were used in combination with various nozzle sizes. One energy unit of diesel fuel could be replaced with about one energy unit of spray injected ethanol, and one energy unit of carbureted ethanol replaced a little more than one energy unit of diesel fuel. Approximately 46 percent of the energy for the turbocharged 65 kW diesel tractor could be supplied by carbureted ethanol, and about 30 percent by the spray-injection approach. Knock limited the extent of substitution of ethanol for diesel fuel. Maximum power was increased by 36 percent with spray-injection approach and about 59 percent with carburetion. Dissert. Abstr.

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N82-20338 Illinois Univ. at Urbana-Champaign.
CALCULATING BUILDING HEATING AND COOLING LOADS USING THE FREQUENCY RESPONSE OF MULTILAYERED SLABS Ph.D. Thesis
Douglas Carl Hittle 1981 221 p
Avail: Univ. Microfilms Order No. 8127608

The development of a method for calculating room heating and cooling loads using frequency response methods to calculate heat flow through multi-layered room walls and roofs is discussed. Existing methods for calculating room loads are discussed and the need to consider the effects of thermal mass are emphasized. A detailed derivation of the solution of the transient one-dimensional heat conduction equation for multi-layered slabs which leads to the calculation of response factors and conduction transfer functions is presented. Next, the special case of a fixed temperature on one side of a multi-layered slab and a sinusoidal temperature variation on the other side is examined and the simplifications which result are described. The use of this simplified method for calculating room heating and cooling loads allows building energy analysis procedures to be implemented on microcomputers. Dissert. Abstr.

N82-20339*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
IDENTIFICATION OF MULTIVARIABLE HIGH PERFORMANCE TURBOFAN ENGINE DYNAMICS FROM CLOSED LOOP DATA
Walter Merrill 1982 16 p refs Presented at the 6th IFAC Symp. on Identification and System Parameter Estimation, Washington, D.C., 7-11 Jun. 1982
(NASA-TM-82785; E-1120; NAS 1.15:82785) Avail: NTIS HC A02/MF A01 CSCL 21E

The multivariable instrumental variable/approximate maximum likelihood (IV/AML) method or recursive time-series analysis is used to identify the multivariable (four inputs-three outputs) dynamics of the Pratt and Whitney F100 engine. A detailed nonlinear engine simulation is used to determine linear engine model structures and parameters at an operating point using open loop data. Also, the IV/AML method is used in a direct identification mode to identify models from actual closed loop engine test data. Models identified from simulated and test data are compared to determine a final model structure and parameterization that can predict engine response for a wide class of inputs. The ability of the IV/AML algorithm to identify useful dynamic models from engine test data is assessed. Author

N82-20340# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Fluid Dynamics Panel.

MODERN DATA ANALYSIS TECHNIQUES IN NOISE AND VIBRATION PROBLEMS

Nov. 1981 164 p refs Proc. of Conf. held at Rhode-St-Genese, Belgium, 7-11 Dec. 1981

(AGARD-R-700; ISBN-92-835-0303-1) Avail: NTIS HC A08/MF A01

Mathematical and statistical procedures are applied to the analysis of noise and vibration. For individual titles, see N82-20341 through N82-20356.

N82-20341# Office National d'Etudes et de Recherches Aeronautiques, Paris (France). Acoustique Div.

MODERN DATA ANALYSIS TECHNIQUES IN NOISE AND VIBRATION PROBLEMS WITH PARTICULAR EMPHASIS ON AEROACOUSTIC APPLICATIONS c39

M. Perulli *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 1-11 refs In FRENCH; ENGLISH summary (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

Classical methods are reviewed and the principles and general theorems and domains of application of modern methods of data analysis presented. Details of the instrumentation requirements for the implementation of these methods and of the practical problems which arise are described. Applications to noise and vibration problems are considered, with reference to particular examples, many of which are chosen to illustrate the intimate connection between acoustics and vibrations in aeroacoustics. J.D.H.

N82-20342# Southampton Univ. (England). Inst. of Sound and Vibration Research.

FLUCTUATING STRESS FIELDS IN CONTINUOUS MEDIA c39

P. E. Doak *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 12-18 (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

The fundamental nature and behavior of stress wave fields in real materials and the selection and interpretation of techniques for measuring stress waves are considered. Nonlinearity is removed from the analysis problem according to the Lighthill acoustic analogy. Finite difference forms of the partial differential equations for linear continuous mechanical systems are derived. This approach simplifies understanding how complicated networks can be approximated by simpler ones, providing insight into the devising of approximate partial differential equations to replace the full elasticity equations representing beams, plates, and shells. The homogeneous isotropic Hookean (stress proportional to strain) continuum is demonstrated to be the simplest ideal continuum model. Employment of the Kelvin-Voight thermoviscoelastic continuum model permits inclusion of viscous and thermal stresses. Orthogonal representations of stress wave fields (eigenfunction series, or Fourier frequency or wave number transforms) are determined to be the most reliable for analytical and/or computational purposes. J.D.H.

N82-20343# Southampton Univ. (England). Inst. of Sound and Vibration Research.

VIBRATION OF STRUCTURES EXCITED ACOUSTICALLY c71

B. L. Clarkson *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 19-37 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

The analytical methods available to estimate the response of structures to vibration are developed on the assumption that the structure itself does not change the properties of the incident sound field by any feed back or flutter type mechanism. The normal mode method is used for the majority of the work to estimate the response to any sound field. Special cases considered are jet noise excitation, turbulent boundary layer pressure excitation, and a reverberant field excitation. The alternative traveling wave method is also introduced. J.D.H.

N82-20344# Cambridge Acoustical Associates, Inc., Mass.

FUNDAMENTAL CONCEPTS OF SOUND RADIATION c71

M. C. Junger *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 38-42 ref (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

The fundamental physical concepts underlying sound radiation are reviewed. The wave equation is derived and its solution constructed for plane waves. Impedance and wave number concepts are introduced. The sound field for a uniformly pulsating spherical radiator and its limiting case, the point source, is derived. Finally, the scaling laws of acoustical model experiments are stated. Author

N82-20345# Naval Ship Research and Development Center, Bethesda, Md.

FUNDAMENTAL CONCEPTS OF FLOW-GENERATED NOISE c71

William K. Blake *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 43-53 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

The fundamental properties of flow-generated sound and vibration are summarized. The elementary source types, the physical parameters governing sound and vibration, and general similarity rules are derived. The rudimentary effects of surfaces on flow generated noise are reviewed. J.D.H.

N82-20346# Cambridge Acoustical Associates, Inc., Mass.

EXTENDED SOUND SOURCES c71

M. C. Junger *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 54-59 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

The point source solution is used to construct the far field of line arrays and its extension to planar sources is described. The alternative, more generally applicable transform technique whereby the far field is evaluated analytically by the method of stationary phase is derived for axisymmetric planar radiators and illustrated for rigid circular piston sources. The transform solution of the sound field radiated by a finite cylinder of arbitrary dynamic configuration is presented. J.D.H.

N82-20347# Naval Ship Research and Development Center, Bethesda, Md.

STOCHASTIC EXCITATION OF ELASTIC STRUCTURES AND EXAMPLES OF FLOW-GENERATED NOISE c71

William K. Blake *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 60-71 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

The fundamentals of flow generated sound are used to determine the important parameters that must be measured to make quantitative evaluations. Using as an example the flow excited vibration of cylinders the principles are related to actual measurements and, as well, the fundamentals of self sustained vibrations are introduced. The important semi-empirical relationships that govern the more complex generation mechanisms of different types are surveyed. J.D.H.

N82-20348# Cambridge Acoustical Associates, Inc., Mass.

SOUND RADIATION BY ELASTIC STRUCTURES c71

M. C. Junger *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 72-75 ref (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

Realistic finite impedance sound radiators whose vibrations are modified by the radiation loading of the ambient fluid are considered. Source fluid interaction is illustrated for the elementary case of a pulsating gas bubble. Sound radiation by flexural waves in plates is also considered. The flexural wave velocity in vacuo and in the radiation loaded plate is derived. Finally, a full fledged interaction problem is solved by the transform technique. The sound field radiated by a force excited effectively infinite elastic plate is constructed, radiation loading being rigorously accounted for. J.D.H.

N82-20349# Southampton Univ. (England). Inst. of Sound and Vibration Research.

THE APPLICATION OF STATISTICAL ENERGY ANALYSIS TO VIBRATION OF STRUCTURES EXCITED ACOUSTICALLY **c39**

B. L. Clarkson *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 76-79 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

In the high frequency range of vibration which can be excited by acoustic pressures, there are usually very many modes of vibration. The individual mode by mode analysis becomes impracticable and an alternative approach based on the energy of vibration in broad frequency bands is more appropriate. By its very nature of averaging the effects over many modes the method is only suitable for randomly excited vibrations. The method is outlined and some experimental results for the parameters required are presented. J.D.H.

N82-20350# Southampton Univ. (England). Inst. of Sound and Vibration Research.

LINEAR SIGNAL PROCESSING 1 **c32**

J. K. Hammond *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 80-91 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

Methods of signal processing emphasizing digital methods applicable to deterministic data are reviewed. Following a discussion of analog to digital conversion, Fourier methods for continuous and sampled data are described, noting the problem of aliasing and the importance of circular convolution. Digital filtering techniques are referred to and methods of 'zoom' analysis are explained. The problem of deconvolution is discussed. J.D.H.

N82-20351# Southampton Univ. (England). Inst. of Sound and Vibration Research.

LINEAR SIGNAL PROCESSING 2 **c32**

J. K. Hammond *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 92-106 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

The treatment of random (stochastic) processes is discussed. This is often referred to as time series analysis in the statistical literature. Computation methods referred to use digital techniques, and the basic principles outlined refer to continuous time processes. Stationary random processes are considered. Correlation functions and spectra are defined. Conventional estimation methods implemented using digital schemes are reviewed. Next the concepts of residual spectra and partial and multiple coherence functions for multi-input systems are explained. Functions of more than one variable are treated. This relates directly to quantities that depend both on space and time. Aspects of two dimensional signal processing are reviewed and some applications are discussed. J.D.H.

N82-20352# Southampton Univ. (England). Inst. of Sound and Vibration Research.

NON-STATIONARITY AND NONLINEARITY IN DATA ANALYSIS **c39**

J. K. Hammond *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 107-116 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

Both time and frequency domain methods are considered, with emphasis on procedures that are generalizations of methods applicable to stationary processes and linear systems. The problem of modeling of processes is also considered. Nonstationary random processes are dealt with. General considerations related to analysis of nonstationary data are discussed, and a time domain approach to the modeling of vehicles traveling over rough ground at variable speed is outlined. This is followed by a description of a class of nonstationary phenomena using the evolutionary spectral density. Nonlinear phenomena in the time domain are considered. A body of theory devoted to the solution of randomly driven nonlinear systems is surveyed. A frequency domain approach for nonlinear systems using the bispectrum is described. A signal processing approach that might be called 'nonlinear' is explained. This is homomorphic signal processing, which has wide application, one of which is the treatment of echo-like processes. J.D.H.

N82-20353# Southampton Univ. (England). Inst. of Sound and Vibration Research.

PARAMETRIC METHODS IN SIGNAL ANALYSIS **c39**

J. K. Hammond *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 117-123 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

Parametric spectral analysis using the maximum entropy method is described. General linear models for time series and how the maximum entropy spectral density relates to autoregressive processes are described. A list of applications of the method is included. A few other parametric approaches to data analysis and system characterization are summarized. J.D.H.

N82-20354# Technische Univ., Berlin (West Germany). Inst. fuer Technische Akustik.

VIBRATION TRANSMISSION AND SOUND RADIATION **c39**

M. Heckl *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 124-141 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

Waves in solids and in gases or fluids are governed by very similar equations which are based on continuity of mass, continuity of momentum, and an equation of state. Therefore sound radiation and vibration transmission into solid media have much in common. Radiation from planar sources, reflection at plane boundaries, the behavior of wave guides, source impedances, etc., are compared and discussed. Author

N82-20355# Cambridge Acoustical Associates, Inc., Mass.

PROCEDURES RELATING THE NEAR- TO THE FAR-FIELD: IMAGING TECHNIQUES **c71**

M. C. Junger *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 142-149 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

The formulation of the pressure field of an arbitrary sound source in terms of the Helmholtz integral is discussed. Analytical and experimental approaches to the evaluation of this integral are described. The latter emphasize the use of measurements taken in the near field. The plane wave asymptotic technique is described. The concept of intensity is introduced and its measurement for harmonic and random signals described. Finally, two types of computer holography are described: one of these provides a wavenumber filtering procedure which reconstructs only the supersonic components of the dynamic configuration of the source; the other reconstructs the actual configuration of the source, as well as the three dimensional pressure and vector intensity fields. J.D.H.

N82-20356# Hewlett-Packard France, Les Ulis (France).

MODAL ANALYSIS USING DIGITAL TEST EQUIPMENT **c39**

Patrick Garcia *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 151-159 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

Modal analysis methods based upon the measurement and post test processing of transfer functions in digital form are discussed. The analysis which shows how modal data can be identified from transfer function measurements is reviewed. This is followed by a discussion of alternative methods for identifying modal data from transfer function measurements. Finally, the effect of vibration in terms of acoustics is covered. Author

N82-20357*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

CRYOGENIC TECHNOLOGY, PART 1

Mar. 1980 273 p refs Conf. held at Hampton, Va., 27-29 Nov. 1979

(NASA-CP-2122-Pt-1; L-13547; NAS 1.55:2122-Pt-1) Avail: NTIS HC A12/MF A01 CSCL 20L

Different engineering problems associated with the design of mechanisms and systems to operate in a cryogenic environment

are discussed. The focal point for the entire engineering effort was the design of the National Transonic Facility, which is a closed-circuit cryogenic wind tunnel. The papers covered a variety of mechanical, structural, and systems design subjects including thermal structures insulation systems, noise, seals, and materials. R.J.F.

N82-20358*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CRYOGENIC TECHNOLOGY, PART 2
Mar. 1980 159 p refs Conf. held at Hampton, Va., 27-29 Nov. 1979
(NASA-CP-2122-Pt-2; L-13547; NAS 1.55:2122-Pt-2) Avail: NTIS HC A08/MF A01 CSCL 20L

Proceedings of a conference on the cryogenic technology developed in support of a transonic wind tunnel are given. Papers address tunnel instrumentation and mode/sting technology. R.J.F.

N82-20359# Long Island Appropriate Technology Group, Wantagh, N.Y.
RESIDENTIAL HEATING AND ENERGY CONSERVATION STUDY, NORTHPORT, NEW YORK. PHASE 1: CITIZEN'S HANDBOOK Progress Report, 1 Jan. - 31 Mar. 1978
Clarence N. Freeman Mar. 1978 65 p refs 2 Vol.
(Grant NSF OSS-77-23950)
(PB82-100454; NSF/RA-780905) Avail: NTIS HC A04/MF A01 CSCL 13A

Subjects on home energy conservation are presented in nontechnical terms. Topics include the behavior of heat and heat exchangers; human comfort; home heating; development of a home heating and maintenance manual; infiltration of cold air; sources of combustion air; dangers of a house which is too airtight; operation of the home during the heating season; condensation problems resulting from re-insulation; heating system maintenance; and possible improvements in hot air, hot water, and steam, gas-fired or oil-fired heating systems. Heat conservation through changing living patterns and rearranging furniture is also discussed. References are provided on the topics of energy conservation, home weatherizing, residential construction, heating systems, emergency situations, weather, and climate. GRA

N82-20360# Long Island Appropriate Technology Group, Wantagh, N.Y.
RESIDENTIAL HEATING AND ENERGY CONSERVATION STUDY, NORTHPORT, NEW YORK. PHASE 2: CITIZEN'S HANDBOOK Progress Report, 1 Oct. - 31 Dec. 1978
Clarence N. Freeman 1978 68 p refs 2 Vol.
(Contract NSF OSS-77-23950)
(PB82-100462; NSF/RA-780906) Avail: NTIS HC A04/MF A01 CSCL 13A

Energy conservation, energy laws of New York State and the United States Government, energy audits in the home, and tax credits are discussed. The behavior of heat and heat exchangers; energy conservation upgrading of the home; methods of taking advantage of heating effects of the Sun; and improving air circulation are discussed. Supplementary energy conservation topics, including a discussion of gas savings resulting from lowering thermostats at night, and a description of an air deflector for baseboard heaters are discussed. Lists of references cover general energy conservation, heat behavior and human comfort, home weatherization, residential construction, heating systems, emergency home heating, and carbon monoxide poisoning from blocked furnace flues. References on climate and degree days are also listed. GRA

N82-20361 California Univ., Berkeley.
MIXED FINITE ELEMENT METHOD FOR EFFICIENT OPTIMAL DESIGN EARTHQUAKE RESISTANT STRUCTURES Ph.D. Thesis
Fathy Mohamed El-Kamshoshy 1981 149 p
Avail: Univ. Microfilms Order No. 8200086

The development of a mixed finite element method useful for efficient optimal design of earthquake resistant structures is presented. For coupled shear walls and unbraced multistory frames subject to a wide range of equivalent static design loads as well as the effect of gravity the method efficiently computes: (1) the inelastic structural response; (2) derivative of the lateral displacement of the top floor with respect to the moment capacity of the developed plastic hinges; and (3) derivatives of the yield angles (angular discontinuities) of the plastic hings with respect to their moment capacity. A wide range of inelasic configurations may be studied using the same structural matrix and introducing plastic hinges at different locations. The derivatives are identified as flexibility coefficients for some segments of the coordinate system. Numerical tests were conducted on coupled shear walls and unbraced frames. In all the numerical tests, complete convergence of the inelastic solution was obtained after four iterations. The derivatives were found and the gradient vectors of the top drift and inelastic energy were computed for a coupled shear wall structure. Dissert. Abstr.

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking.*

N82-20362*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.
THE 30/20 GHz FLIGHT EXPERIMENT SYSTEM, PHASE 2. VOLUME 1: EXECUTIVE SUMMARY Final Report, Apr. 1980 - Mar. 1981
L. Bronstein, Y. Kawamoto, J. J. Ribarich, J. R. Scope, B. J. Forman, S. G. Bergman, and S. Reisenfeld Jul. 1981 122 p 4 Vol.
(Contract NAS3-22340)
(NASA-CR-165409-Vol-1; NAS 1.26:165409-Vol-1; SCG-810338R) Avail: NTIS HC A06/MF A01 CSCL 17B

Summary information on the final communication system design, communication payload, space vehicle, and development plan for the 30/20 GHz flight experiment will be installed on the LEASAT spacecraft which will be placed into orbit from the space shuttle cargo bay. The communication concept has two parts: a truck service and a customer premise service (CPS). The trucking system serves four spot beams which are interconnected in a satellite switched time division multiple access mode by an IF switch matrix. The CPS covers two large areas of the eastern United States with a pair of scanning beams. M.G.

N82-20363*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.
THE 30/20 GHz FLIGHT EXPERIMENT SYSTEM, PHASE 2. VOLUME 2: EXPERIMENT SYSTEM DESCRIPTION Final Report, Apr. 1980 - Mar. 1981
L. Bronstein, Y. Kawamoto, J. J. Ribarich, J. R. Scope, B. J. Forman, S. G. Bergman, and S. Reisenfeld Jul. 1981 469 p 4 Vol.
(Contract NAS3-22340)
(NASA-CR-165409-Vol-2; NAS 1.26:165409-Vol-2; SCG-810339R) Avail: NTIS HC A20/MF A01 CSCL 17B

A detailed technical description of the 30/20 GHz flight experiment system is presented. The overall communication system is described with performance analyses, communication operations, and experiment plans. Hardware descriptions of the payload are given with the tradeoff studies that led to the final design. The spacecraft bus which carries the payload is discussed and its interface with the launch vehicle system is described. Finally, the hardwares and the operations of the terrestrial segment are presented. R.J.F.

N82-20364*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.
THE 30/20 GHz FLIGHT EXPERIMENT SYSTEM, PHASE 2. VOLUME 3: EXPERIMENT SYSTEM REQUIREMENT DOCUMENT Final Report Apr. 1980 - Mar. 1981
L. Bronstein, Y. Kawamoto, J. J. Ribarich, J. R. Scope, B. J. Forman, S. G. Berman, and S. Reisenfeld Jul. 1981 25 p 4 Vol.
(Contract NAS3-22340)

(NASA-CR-165409-Vol-3; NAS 1.26:165409-Vol-3; SCG-810340R) Avail: NTIS HC A02/MF A01 CSCL 17B

An approach to the requirements document to be used to procure the system by NASA is presented. The basic approach is similar to the requirements document used in the commercial communication satellite. Enough detail requirements are given to define the system without tight constraints. R.J.F.

N82-20365*# Hughes Aircraft Co., El Segundo, Calif. Space and Communications Group.

THE 30/20 GHz FLIGHT EXPERIMENT SYSTEM, PHASE 2. VOLUME 4: EXPERIMENT SYSTEM DEVELOPMENT PLAN Final Report, Apr. 1980 - Mar. 1981

L. Bronstein, Y. Kawamoto, J. J. Riberich, J. R. Scope, B. J. Forman, S. G. Bergman, and S. Reisenfeld Jul. 1981 40 p 4 Vol.

(Contract NAS3-22340)

(NASA-CR-165409-Vol-4; SCG-8103411R; NAS 1.26:165409-Vol-4; SCG-810341R) Avail: NTIS HC A03/MF A01 CSCL 17B

The development plan for the 30/20 GHz flight experiment system is presented. A master program schedule with detailed development plans for each subsystem is planned with careful attention given to how technology items to ensure a minimal risk. The work breakdown structure shows the organization of the program management with detailed task definitions. The ROM costs based on the development plan are also given. R.J.F.

N82-20366*# Texas Instruments, Inc., Huntsville, Ala.

AIRBORNE ELECTRONICALLY STEERABLE PHASED ARRAY (AESPA) PROGRAM Final Report

Nov. 1979 124 p refs

(Contract NAS8-33116)

(NASA-CR-161395; NAS 1.26:161395; U1-771401-F) Avail: NTIS HC A06/MF A01 CSCL 20N

The basic concept and design of a flatplate-fed transmission array are described and system performance requirements are summarized. Particular emphasis is given to the design of the aperture, the radiating element, the phase shifter, the flatplate feed, and the mechanical support structure. Fabrication and testing techniques are considered. Of the three major parameters of interest in demonstrating the performance capabilities of the transmissive array, beamwidth was shown to be the least sensitive to system amplitude and phase errors. Beam pointing angle was also shown to be relatively insensitive to errors. Close agreement between measured and calculated values was found for array gain. The greatest difference was found for array sidelone level. A.R.H.

N82-20367*# South Carolina Univ., Columbia. Coll. of Engineering.

A STUDY OF MICROWAVE DOWNCOVERTERS OPERATING IN THE K SUB u BAND Final Report

Rufus G. Fellers, Ted L. Simpson, and Bangjuh Tseng [1982] 195 p refs

(Contract NAS8-28660)

(NASA-CR-161393; NAS 1.26:161393) Avail: NTIS HC A09/MF A01 CSCL 09C

A computer program for parametric amplifier design is developed with special emphasis on practical design considerations for microwave integrated circuit degenerate amplifiers. Precision measurement techniques are developed to obtain a more realistic varactor equivalent circuit. The existing theory of a parametric amplifier is modified to include the equivalent circuit, and microwave properties, such as loss characteristics and circuit discontinuities are investigated. S.L.

N82-20368# Committee on Science and Technology (U. S. House).

POTENTIAL HEALTH EFFECTS OF VIDEO DISPLAY TERMINALS AND RADIO FREQUENCY HEATERS AND SEALERS

Washington GPO 1981 768 p refs Hearings before the Subcomm. on Investigations and Oversight of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 13, 12-13 May 1981

(GPO-80-998) Avail: Subcomm. on Investigations and Oversight

Video display terminals and radio frequency heaters and sealers have wide industrial applications. Both of these technologies involve the use of nonionizing radiation. Radiation leakages from these devices and their potential health effects are investigated. S.L.

N82-20369# European Space Agency, Paris (France).

CONTRIBUTIONS TO THE COLLOQUIUM ON RADIO FREQUENCIES IN AEROSPACE

H. Oettl, comp. Dec. 1981 124 p refs Transl. into ENGLISH of "Beitraege zum Kolloq. 'Hochfrequenztech. in der Luft- u. Raumfahrt'", Rept. DFVLR-Mitt-80-10 DFVLR, Oberpfaffenhofen, West Germany, Jun. 1980 Proceedings held at Oberpfaffenhofen, West Germany, 23 Jun. 1980

(ESA-TT-704; DFVLR-Mitt-80-10) Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 21,80

Radio frequency techniques in space applications are considered. Communication, navigation, and tracking systems are discussed. For individual titles, see N82-20370 through N82-20377.

N82-20370# European Space Agency, Paris (France).

PROFESSOR GUENTER ULBRICHT: THE SCIENTIST AND THE MAN. AN APPRECIATION

Heinz Haeberle *In its* On Radio Frequencies in Aerospace (ESA-TT-704) Dec. 1981 p 6-10 Transl. into ENGLISH from "Beitraege zum Kolloq. 'Hochfrequenztech. in der Luft- u. Raumfahrt'", Rept. DFVLR-Mitt-80-10 DFVLR, Oberpfaffenhofen, West Germmany, Jun. 1980 (For primary document see N82-20369 11-32)

Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 21,80

The career of Dr. Guenther Ulbricht, professor of engineering, is recounted and his many professional accomplishments are praised. On May 12, 1980 he celebrated his 75th birthday. Author (ESA)

N82-20371# European Space Agency, Paris (France).

THE OBJECT OF RF TECHNOLOGY IN AEROSPACE

Wolfgang Keydel *In its* On Radio Frequencies in Aerospace (ESA-TT-704) Dec. 1981 p 11-25 refs Transl. into ENGLISH from "Beitraege zum Kolloq. 'Hochfrequenztech. in der Luft- u. Raumfahrt'", Rept. DFVLR-Mitt-80-10 DFVLR, Oberpfaffenhofen, West Germany, Jun. 1980 (For primary document see N82-20369 11-32)

Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 21,80

Two aspects of radio frequency technology in aviation and space systems engineering are considered, i.e., interference phenomena and antenna design. Multipath problems and the dimensioning of a seeking antenna for an antiaircraft missile are cited as examples. Multipath effects cause fading in communication channels and angle errors in tracking radars. Measured results of fading in a satellite communication link and of the image effect observed with a radar tracking a target flying over water are presented. Computation of possible angle errors in a monopulse radar is demonstrated. The design of a seeking antenna with respect to system requirements for an antiaircraft missile is illustrated. Relations between antenna parameters and missile flight parameters are derived from proportional navigation conditions. Author (ESA)

N82-20372# European Space Agency, Paris (France).

DEEP SPACE MISSIONS: PAST AND FUTURE

Philip Hartl *In its* On Radio Frequencies in Aerospace (ESA-TT-704) Dec. 1981 p 26-46 refs Transl. into ENGLISH from "Beitraege zum Kolloq. 'Hochfrequenztech. in der Luft- u. Raumfahrt'", Rept. DFVLR-Mitt-80-10 DFVLR, Oberpfaffenhofen, West Germany, Jun. 1980 (For primary document see N82-20369 11-32)

Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 21,80

Deep space missions during the 70's are reviewed and compared. Data transmission rates and accuracy in position determination are emphasized. The Deep Space Network is briefly described. Missions discussed include Helios, Pioneer, Viking, Pioneer Venus, and Voyagers 1 and 2. Missions for the 80's are considered. These are Galileo, the International Solar Polar Mission, and Giotto (Comet Halley Flyby). The potential for interstellar missions is also considered. Author (ESA)

N82-20373# European Space Agency, Paris (France).
HYDROMAGNETIC WAVES IN SOLAR PLASMA FROM REMOTE SENSING MEASUREMENTS OF HELIOS
Peter Edenhofer *In its* On Radio Frequencies in Aerospace (ESA-TT-704) Dec. 1981 p 47-57 refs Transl. into ENGLISH from "Beitraege zum Kolloq. 'Hochfrequenztech. in der Luft- u. Raumfahrt'", Rept. DFVLR-Mitt-80-10 DFVLR, Oberpfaffenhofen, West Germany, Jun. 1980 (For primary document see N82-20369 11-32)
Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 21,80

The fine structure of periodicity during solar occultations is inferred from the temporal variations of columnar electron content measurements made by the Helios space probes. A maximum entropy spectral analysis reveals significant frequency peaks within the range 0.2 to 3 mHz. A comparison with Helios Faraday rotation measurements indicates hydromagnetic waves. This provides experimental evidence that such waves, with a typical fundamental period of 1 hour, exist in the solar corona.
Author (ESA)

N82-20374# European Space Agency, Paris (France).
PROBLEMS WITH MOBILE SATELLITE COMMUNICATIONS
Herwig Oettl *In its* On Radio Frequencies in Aerospace (ESA-TT-704) Dec. 1981 p 58-74 refs Transl. into ENGLISH from "Beitraege zum Kolloq. 'Hochfrequenztech. in der Luft- u. Raumfahrt'", Rept. DFVLR-Mitt-80-10 DFVLR, Oberpfaffenhofen, West Germany, Jun. 1980 (For primary document see N82-20369 11-32)
Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 21,80

Three aspects of satellite communication with mobile ground stations are examined: satellite transmission efficiency, suitable equipment for mobile units, and transmission media characteristics. Possibilities for large geostationary satellite structures, e.g., the Public Service Platform, a multibeam antenna, are considered. The equipment for the German experimental ship terminal is described. Transmission measurement results (1.5 GHz) at low elevation angles are emphasized. Atmospheric influences, multipath effects, and signal fading are analyzed for transmissions via ATS-6 and MARISAT satellites. Author (ESA)

N82-20375# European Space Agency, Paris (France).
MRSE: A MICROWAVE REMOTE SENSING EXPERIMENT IN SPACELAB
Marian Werner *In its* On Radio Frequencies in Aerospace (ESA-TT-704) Dec. 1981 p 75-83 Transl. into ENGLISH from "Beitraege zum Kolloq. 'Hochfrequenztech. in der Luft- u. Raumfahrt'", Rept. DFVLR-Mitt-80-10 DFVLR, Oberpfaffenhofen, West Germany, Jun. 1980 (For primary document see N82-20369 11-32)
Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 21,80

The design and development of the microwave remote sensing experiment are discussed. The equipment allows for three operating modes: scatterometry, synthetic aperture radar, and microwave radiometry. Sea state measurement, radar imagery, and passive detection of terrestrial radiation are planned.
Author (ESA)

N82-20376# European Space Agency, Paris (France).
A PAYLOAD PACKAGE WITH COMMUNICATIONS AND NAVIGATION EXPERIMENTS FOR SPACE SHUTTLE MISSIONS
Horst Goessl, Max Fey, David Hounam, and Peter Sliwinski *In its* On Radio Frequencies in Aerospace (ESA-TT-704) Dec. 1981 p 84-100 refs Transl. into ENGLISH from "Beitraege zum Kolloq. 'Hochfrequenztech. in der Luft- u. Raumfahrt'", Rept. DFVLR-Mitt-80-10 DFVLR, Oberpfaffenhofen, West Germany, Jun. 1980 (For primary document see N82-20369 11-32)
Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 21,80

The specification of a package of communications and navigation experiments (COMNAV) for the Spacelab D1 payload is summarized. The COMNAV facility corresponds to a minimum configuration of the onboard instrumentation, as defined in a previous report. This configuration enables six of the proposed experiments to be performed in L band. The payload features modular construction and can be extended to include experiments operating in the 30 GHz range. It is largely independent of Spacelab, so that few modifications are necessary if the payload is to be flown on a shuttle-only mission. Examples are also given of what general conditions must be met so that COMNAV experiments can be combined with other spaceborne experiments.
Author (ESA)

N82-20377# European Space Agency, Paris (France).
THE STATE OF DEVELOPMENT OF RADIO LOCATION IN SPACEFLIGHT
Siegfried Starker *In its* On Radio Frequencies in Aerospace (ESA-TT-704) Dec. 1981 p 101-124 refs Transl. into ENGLISH from "Beitraege zum Kolloq. 'Hochfrequenztech. in der Luft- u. Raumfahrt'", Rept. DFVLR-Mitt-80-10 DFVLR, Oberpfaffenhofen, West Germany, Jun. 1980 (For primary document see N82-20369 11-32)
Avail: NTIS HC A06/MF A01; DFVLR, Cologne DM 21,80

The development of navigation and positioning technology is assessed, while those areas in which advances are most urgently needed are identified. A state of the art flow model, showing the mutual influence of different research endeavors as well as their impact on future research goals, is presented. Positioning and navigation, using satellite networks or satellite-borne systems, are considered. The application of recently developed electronic equipment, such as microprocessors and minicomputers, is mentioned. Terrestrial surface navigation capabilities are also discussed as a spin-off of spaceborne remote sensing activities.
Author (ESA)

N82-20378# Meteor Communications Consultants, Inc., Kent, Wash.
FEASIBILITY STUDY UTILIZING METEOR BURST COMMUNICATIONS FOR VESSEL MONITORING Final Report, Sep. 1980 - Apr. 1981
R. E. Leader Nov. 1981 73 p
(Contract DTRS57-80-C-00171)
(AD-A109004; USCG-D-68-81; TSC-USCG-81-4) Avail: NTIS HC A04/MF A01 CSCL 17/2

This document discusses the feasibility of using meteor burst communications for monitoring vessel position, in particular the Prince William Sound VMS near Valdez, Alaska. This document describes the equipment and operational performance of meteor burst in the telemetry of vessel position data.
Author (GRA)

N82-20379# Hazeltine Corp., Greenlawn, N. Y.
DESIGN, FABRICATION AND TEST OF A METAL-GRID ANGULAR FILTER Final Technical Report, Jun. 1980 - May 1981
John F. Pedersen and Peter W. Hannan Griffiss AFB, N.Y. RADC Nov. 1981 167 p refs
(Contract F19628-78-C-0152; AF Proj. 4600)
(AD-A108795; Rept-6436; RADC-TR-81-282) Avail: NTIS HC A08/MF A01 CSCL 20/3

The design, fabrication and testing of a metalgrid spatial filter is reported. It is a 5 x 5 foot flat panel incorporating 4 layers of crossed wire grids in a supporting structure of dielectric skins and dielectric honeycomb material. The spatial filter passes an electromagnetic wave incident within its angular passband centered on normal incidence, but reflects the wave if it is incident beyond about 30 degrees in the angular reject band, a result obtained for any polarization of the wave. It operates at 9 GHz, and has a bandwidth of about 1 GHz for passing a wave at normal incidence. There is more rejection for angles of incidence in the H plane then for incidence in the E plane. Placement of the spatial filter in front of a reflector antenna results in a significant reduction of antenna sidelobes beyond 30 degrees from the main beam in both the H plane and the E plane. There is only a slight degradation of the antenna sidelobes within the angular passband of the filter.
M.D.K.

N82-20380# University of Southeastern Massachusetts, North Dartmouth. Dept. of Electrical Engineering.
TIME DELAY ESTIMATION: FOR KNOWN AND UNKNOWN SIGNALS
C. H. Chen and Shiunn-Jang Chern 25 Nov. 1981 50 p refs
(Contract N00140-81-Q-MM54)
(AD-A109008; SMU-EE-TR-81-15) Avail: NTIS HC A03/MF A01 CSCL 09/4

Time delay estimation using Hassab-Boucher windows is extensively examined by computer simulation for both known

and unknown (random) signals. Optimum number of data segments is determined for the best result in time delay estimate. For the unknown signal case, the Burg's maximum entropy spectral estimation algorithm is used to estimate the signal spectral density used in the design of Hassab-Boucher windows. Author (GRA)

N82-20381# Pennsylvania Univ., Philadelphia. School of Electrical Engineering.

HIGH ANGULAR RESOLUTION MICROWAVE SENSING WITH LARGE, SPARSE, RANDOM ARRAYS Annual Technical Report, 1 Oct. 1980 - 30 Sep. 1981

C. Nelson Dorny and Bernard D. Steinberg Nov. 1981 18 p refs

(Grant AF-AFOSR-3688-78; AF Proj. 2305)

(AD-A109036; UP-VFRC-40-81; AFOSR-81-0836TR) Avail: NTIS HC A02/MF A01 CSCL 17/9

This document describes progress toward development of a general capability for high resolution microwave surveillance and imaging using large, sparse, self-cohering arrays. During the last year progress has been made in the following areas: Assessment of the potential advantages of large self-cohering arrays, development of advanced system concepts (ground-based, airborne and spaced-based radio cameras), refinement of self-cohering techniques compatible with these system concepts, hardware testing of self-cohering techniques compatible with these system concepts, hardware testing of self-cohering techniques, and development of methods for enhancement of image quality associated with large sparse arrays. Author (GRA)

N82-20382# National Oceanic and Atmospheric Administration, Norman, Okla. National Severe Storms Lab.

CONSIDERATIONS FOR THE DESIGN OF GROUND CLUTTER CANCELERS FOR WEATHER RADAR Interim Report, Apr. 1980 - Feb. 1981

Dusan S. Zrnic and Said Hamidi Washington FAA Feb. 1981 85 p refs

(Contract DTFA01-80-Y-10524)

(AD-A109624; FAA-RD-81-72) Avail: NTIS HC A05/MF A01 CSCL 17/9

Study of the ground clutter problem at the Norman site indicates that clutter cross sections of 40 to 50 dB below 1 sq. m/sq. m are typical. Doppler spectrum width, Tau sub c, of the clutter signal is between 0.1 and 1 m/s with the mean value of 0.25 m/s at an antenna rotation rate of 10 deg/s. The design of clutter filters is very much dependent on this width and for proper cancellation the passband cutoff velocity v sub p must be larger or equal to 4.8 Tau sub c. Several canceling schemes are investigated, and the most efficient one is with a third order recursive filter. This filter achieves a 50 dB rejection in the stop band with total annihilation of dc. One dB ripple is in the passband, and the ratio of passband cutoff v sub p to stop band cutoff v sub s is about 3.5. The filter operates best in steady state, but it can also be made to operate in transient by properly initializing its memory elements. Performance on 64 simulated and real time samples show that no more than 10 dB loss in effective canceling over steady state occurs if the filter is initialized. To minimize weather signal loss, canceling is recommended only in regions that contain clutter. Therefore, the range extent over which canceling is performed should vary with elevation. Also the antenna rotation at the two lowest angles should be slower. Author (GRA)

N82-20383# Naval Electronic Systems Command, Washington, D. C.

EXTREMELY LOW FREQUENCY (ELF) COMMUNICATIONS PROGRAM IN WISCONSIN AND MICHIGAN. SYSTEM AND SITE DEFINITION, PROGRAM PLANS, ENVIRONMENTAL SUMMARY AND SUPPLEMENTAL INFORMATION Planning Report, 1981 - 1986

Dec. 1981 40 p refs

(AD-A109555) Avail: NTIS HC A03/MF A01 CSCL 17/2

U.S. Navy communications with submarines will be improved by deploying a small, operational Extremely Low Frequency (ELF) communications system. This system will be attained by upgrading the existing ELF Communications Facility near Clam Lake, Wisconsin and building a second ELF Communications facility in the Upper Peninsula of Michigan. The two facilities will be operated synchronously when completed and will transmit coded messages to ELF receiving systems installed on all submarines. This report identifies the work to be done to implement the ELF communications plan approved by the President. GRA

N82-20384# Naval Research Lab., Washington, D. C. Space Science Div.

COMPUTER-PROGRAM MODEL FOR PREDICTING HORIZONTALLY AND VERTICALLY POLARIZED VLF ATMOSPHERIC RADIO NOISE AT ELEVATED RECEIVERS Final Report

Francis J. Kelly, J. P. Hauser, and F. J. Rhoads 28 Dec. 1981 22 p refs

(AD-A109448; NRL-8479) Avail: NTIS HC A02/MF A01 CSCL 20/14

A computer program was developed that can predict horizontally and vertically polarized atmospheric radio noise at any altitude or location in the Earth-ionosphere waveguide in the very-low-frequency (VLF) range from 10 to 30 kHz. The new program, HORNS, uses the outputs of two previously written programs, COMPWR and NOISLAN, which predict the vertical electric noise field at the ground. The HORNS program computes all the field components at any altitude using the vertical electric field at the Earth's surface as a basis. Predicted values from several versions of the new model were compared with presently available data. The results are encouraging, but more data are needed to test the model. GRA

N82-20385# Naval Research Lab., Washington, D. C. Airborne Radar Branch.

EXACT SOLUTIONS FOR THE TIME CONSTANTS OF AN ADAPTIVE ARRAY IN BANDLIMITED NOISE Interim Report

Karl Gerlach 24 Dec. 1981 25 p refs

(WF12000001).

(AD-A109580; NRL-8542) Avail: NTIS HC A02/MF A01 CSCL 09/4

A technique is presented that yields closed form solutions for the noise analysis of the Applebaum adaptive algorithm. Past researchers derived results under the assumption that the input noise is stationary and rapidly varying with respect to the output weighting vector of the Applebaum algorithm. This work was extended to include noise that is not stationary and can vary at any rate. External noise souces are modelled as continuous state jump Markov processes which results in exact first moment equations for the weighting vector that are solvable. Specifically, the case where the adaptive algorithm is subjected to a single external noise source is examined in detail. Results in adaptive processing convergence times are presented. GRA

N82-20386# Syracuse Univ., N. Y. Dept. of Electrical and Computer Engineering.

A MOMENT SOLUTION FOR ELECTROMAGNETIC COUPLING THROUGH A SMALL APERTURE

Joseph R. Mautz and Roger F. Harrington Dec. 1981 54 p refs

(Contract N00014-76-C-0225)

(AD-A109721; TR-81-13; TR-14) Avail: NTIS HC A04/MF A01 CSCL 20/3

A three-term moment solution for electromagnetic coupling through a small aperture in a conducting screen is obtained. This solution gives the equivalent magnetic current in the aperture as a linear combination of the three quasi-static magnetic currents responsible for the three dipole fields seen in the far zone. Because only the dipole effects of the quasi-static currents are known, the elements of the excitation vector and the moment matrix can not be evaluated directly. Reciprocity is used to express the elements of the excitation vector in terms of the short-circuit incident fields. The imaginary parts of the elements of the moment matrix are evaluated by forcing the moment solution to be equal to the solution predicted by conventional small aperture theory. The real parts of the elements of the moment matrix are extracted from the quadratic expression for the power radiated by the magnetic current. The solution is applied to three examples - an aperture in a conducting plane, an aperture in a transverse wall between two rectangular waveguides, and an aperture in a lateral wall of a rectangular waveguide coupling to a half-space. Author (GRA)

N82-20387# Defense Mapping Agency Hydrographic and Topographic Center, Washington, D.C.
CHART CORRECTIONS VIA GLOBAL COMMUNICATIONS SYSTEMS
Morris F. Glenn 28 Dec. 1981 16 p refs
(AD-A109816) Avail: NTIS HC A02/MF A01 CSCL 17/2

The United States Defense Mapping Agency (DMA) designed the Automated Notice to Mariners System (ANMS) with the hardware and software capability to utilize modern communications systems. ANMS automation speeds processing of printed documents and provides a real-time means of disseminating DMA's chart corrections data on a global basis. It was designed to allow incorporation of new communication techniques such as shipboard satellite communications. The ANMS design allows multiple communication interfaces to be installed on DMA's Prime 400 computer for access to chart corrections data files. The ANMS can support simultaneous remote queries from any or all of the following: a portable terminal calling over a dial-up telephone line from anywhere in the world; a telephone query from a ship at sea which is equipped with shipboard satellite system and a portable terminal; a TWX link; a Telex link; and, data transfers via commercial data transmission networks (under study). Satellite data queries via MARISAT were successfully tested to show the capability of modern communications to obtain chart corrections by mariners while they are still at sea. M.D.R.

N82-20388# Lincoln Lab., Mass. Inst. of Tech., Lexington.
EFFECTS OF SANDSTORMS AND EXPLOSION-GENERATED ATMOSPHERIC DUST ON RADIO PROPAGATION
Robert P. Rafuse 10 Nov. 1981 66 p refs
(Contract F19628-80-C-0002)
(AD-A109490; DCA-16; ESD-TR-81-290) Avail: NTIS HC A04/MF A01 CSCL 20/14

Suspended particulate matter in the atmosphere, generated by natural phenomena such as dust and sandstorms or by man-made near-surface explosions, has been suspected as a cause of microwave and millimeter-wave communications systems outages. An analysis carried out on the radio-frequency and optical effects of such dust clouds and the results, coupled with available information on particle-size distributions and suspended mass, indicates that the radio-frequency effects should be essentially negligible. However, observed changes in the atmospheric pressure, temperature, and humidity which accompany dust storms (and explosions) can account for all of the observed effects on microwave links. With the exception of water entrained in large explosions, most such effects are, however, virtually frequency-independent; therefore, duststorm activity and clouds raised by detonations should not be considered a threat peculiar to EHF SATCOM or other millimeter-wave based communications systems. Author (GRA)

N82-20389# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
NOTES ON OPTIMAL ROUTING AND FLOW CONTROL FOR COMMUNICATION NETWORKS
Dimitri P. Bertsekas Dec. 1981 57 p refs
(Contract N00014-75-C-1183; NR Proj. 049-383)
(AD-A109626; LIDS-R-1169) Avail: NTIS HC A04/MF A01 CSCL 12/1

The main purpose of routing and flow control in a communication network is, roughly speaking, to keep delay per message within an acceptable level while minimizing the amount of offered traffic that is rejected by the network due to its inability to handle it. These two objectives are clearly contradictory so a good routing and flow control scheme must strike a balance between the two. It should also take into account a number of other issues such as fairness for all users, the possibility that the network topology can be altered due to unexpected link or node failures, and the fact that the statistics of offered traffic change with time. Aspects of routing and flow control for long-haul wire data networks in which the communication resource is scarce, and where there are no issues of contention resolution due to random access of a broadcast medium are considered. Primary emphasis is placed on optimal procedures since these offer a more sound philosophical basis than heuristic schemes and also provide a yardstick for measuring the effectiveness of other methods. GRA

N82-20390# Semcor, Inc., Neptune, N.J.
COMPUTER PROGRAM USER'S MANUAL FOR FIREFINDER DIGITAL TOPOGRAPHIC DATA VERIFICATION LIBRARY DUBBING SYSTEM
Marie Ceres and Leslie R. Heselton, III 30 Nov. 1981 216 p
(Contract DAAK20-79-D-0500)
(AD-A109617; DRCPM-FFR-TM-1181) Avail: NTIS HC A10/MF A01 CSCL 17/9

This manual describes the computer programs for the FIREFINDER Digital Topographic Data Verification-Library-Dubbing System (FFDTDVLDS), and will assist in the maintenance of these programs. The manual contains detailed flow diagrams and associated descriptions for each computer program routine and subroutine. Complete computer program listings are also included. This information should be used when changes are made in the computer programs. The operating system has been designed to minimize operator intervention. GRA

N82-20391# Systems Control, Inc., Palo Alto, Calif.
MULTITARGET TRACKING STUDIES Final Report, 4 Jun. 1980 - 3 Jul. 1981
Benjamin Friedlander Jul. 1981 68 p refs
(Contract N00014-79-C-0743; NR Proj. 277-287)
(AD-A109578; SCI-5334-02) Avail: NTIS HC A04/MF A01 CSCL 17/7

This report presents the results of Phase 2 of an investigation of a new concept for tracking multiple targets. This concept is based on parametric modeling of the observed data. The recursive maximum likelihood algorithm was used to estimate the parameters of an ARMA model. The single channel version of the algorithm was used as an adaptive IIR filter. The algorithm was applied to: adaptive line enhancement, adaptive noise cancelling, high resolution spectral estimation, time delay estimation, and adaptive deconvolution. The multichannel version of the algorithm was used to estimate TDOAs and spectral parameters of multiple targets. Results based on simulations using synthetic data are presented. Author (GRA)

N82-20392# Transportation Systems Center, Cambridge, Mass. Research and Special Programs Administration.
TEST PLAN FOR SSR Final Report
Janis Vilcans Washington FAA Oct. 1981 143 p
(AD-A109503; FA-180-PM-81-40; DOT-FAA-RD-81-64; TSC-FAA-81-23) Avail: NTIS HC A07/MF A01 CSCL 17/9

A comprehensive test plan is presented to evaluate the impact of wind and ice loading on the rotation rate stability of a Secondary Surveillance Radar (SSR) antenna used for air traffic control surveillance. Antenna rotation rate variations may introduce errors in the estimate of a position of an intruding aircraft in a passive collision avoidance system used in conjunction with the SSR antenna. The test plan provides a method for determining the statistics of the antenna rotation rate variations. Analytical methods are then presented to assess the effects on CAS performance. The measurement system design, mathematical model development of the antenna system, test data reduction, and analysis programs are presented in detail. Sample calculations of preliminary field data are given and compared with the results obtained from computer simulations. The computer simulations are also intended to predict antenna rotation rate variations at the upper limits of the FAA specified range, which were not generally encountered during normal operations. Author (GRA)

N82-20393# Electromagnetic Systems Labs., Inc., Sunnyvale, Calif.
PLACES QUICK-LOOK REPORT FOR BEACON AND AIRCRAFT EXPERIMENTS Final Report, 19 Dec. 1979 - 31 Mar. 1981
James Marshall, Jeff Lehman, Gary Elston, and Wayne Solbrig 31 Mar. 1981 223 p refs
(Contract DNA001-80-C-0090)
(AD-A109679; ESL-TM1344; DNA-5737F) Avail: NTIS HC A10/MF A01 CSCL 20/14

During December 1980 the Position Location and Communication Effects Simulations (PLACES) Experiment was conducted to investigate the effects of structured ionospheric plasmas on satellite communications and navigation systems. A structured plasma environment was created by a 48 kgm barium

release from a rocket launched from Eglin AFB, FL. Measurements of propagation effects on signals from the LES-8 satellite over the Pacific Ocean to a KC 135/662 aircraft operating in the Florida area were conducted (Aircraft Experiment) as well as measurements of the time-of-arrival spread of energy on a phase coded spread spectrum signal emanating from a rocket launched behind the barium cloud and received at specially constructed ground receiving sites in northern Florida (Beacon Experiment). This report presents a quick-look at the data measurements obtained from the aircraft and beacon experiments. Author (GRA)

N82-20394# Harry Diamond Labs., Adelphi, Md.
TNF/S C3/D CONDUCT: A SIMULATION MODEL OF THE ARMY'S COMMAND, CONTROL, COMMUNICATIONS, AND INTELLIGENCE (C3I) PROCESS
Thomas V. Noon and Egon Marx Nov. 1981 24 p
(AD-A109579; HDL-TR-1974) Avail: NTIS HC A02/MF A01 CSCL 17/2

A computer model (CONDUCT) has been developed that simulates corps and subordinate command, control, communications, and intelligence C3I functions with particular emphasis on the integration of the new generation of intelligence, surveillance, and target-acquisition systems within the developing 1982 and 1986 force structure. CONDUCT is an event-by-event simulation model written in GPSS-V (General Purpose Simulation System), representing the combat and combat support command/staff elements and communications nodes/nets for the operations and intelligence functions within a type corps. Maneuver and engineer units are represented to platoon level, artillery units to battery level, and target-acquisition and Combat Electronics Warfare Intelligence (CEWI) units to sensor team level. Major command posts and operations centers are subdivided into their primary functional areas. Also given are results from the initial 16 hr combat simulation. GRA

N82-20212# Societe Nationale Industrielle Aerospatiale, Cannes (France).
SOFA: SYSTEM D'ORIENTATION FINE D'ANTENNE (AN ANTENNA FIN POINTING) MECHANISM
Bernard Hubert and Pierre Brunet *In* AGARD Spacecraft and Position Control Nov. 1981 13 p (For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

N82-20350# Southampton Univ. (England). Inst. of Sound and Vibration Research.
LINEAR SIGNAL PROCESSING 1
J. K. Hammond *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 80-91 refs (For primary document see N82-20340 11-31)
Avail: NTIS HC A08/MF A01

N82-20351# Southampton Univ. (England). Inst. of Sound and Vibration Research.
LINEAR SIGNAL PROCESSING 2
J. K. Hammond *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 92-106 refs (For primary document see N82-20340 11-31)
Avail: NTIS HC A08/MF A01

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N82-20395 Illinois Univ. at Urbana-Champaign.
THE PREDICTION OF THE THERMAL AND HYDRAULIC PERFORMANCE OF UNDERGROUND ELECTRIC TRANSMISSION SYSTEMS WITH TURBULENT FORCED CONVECTION COOLING Ph.D. Thesis
Richard Ghetzler 1981 137 p
Avail: Univ. Microfilms Order No. 8127597

Heat transfer and friction factors were experimentally determined in a scale model of high voltage underground transmission systems for Reynolds numbers up to 8000. Two ratios of cable to enclosure pipe were considered, corresponding to standard and oversize enclosure pipes. Helical wire wrap was included to simulate protective skid wires around the cables. Three configurations of cable positioning were considered. A method of generalizing the heat transfer coefficients was developed and tested for pipe cables. Friction factors were determined experimentally for cables with up to 13 percent snaking, to simulate cable buckling due to thermal expansion. Hydraulic losses downstream of a buckled section, and through a sudden expansion at the outlet of a cable system were developed for friction factor as a function of cable snaking. Dissert. Abstr.

N82-20396 Michigan Univ., Ann Arbor.
A MONOLITHIC THERMOPILE DETECTOR FABRICATED USING INTEGRATED CIRCUIT TECHNOLOGY Ph.D. Thesis
Gholamhassan Roientan Lahji 1981 118 p
Avail: Univ. Microfilms Order No. 8125149

A thermopile infrared detector fabricated using silicon integrated-circuit technology has been investigated. The device uses a series-connected array of thermocouples whose hot junctions are supported on a thin silicon membrane formed using anisotropic chemical etching and a diffused boron etch-stop. The membrane size and thickness control the speed and responsivity of the structure, which can be designed for a given application. For a membrane measuring 400 cu microns and containing sixty bismuth-antimony couples, the structure produces a responsivity of 6 volts/watt and a time constant of about 15 msec. This responsivity is comparable to that of commercial thermopile detectors of similar die size, while the speed is faster by a factor of about four. Using sixty polysilicon-gold thermocouples on the same size diaphragm, the responsivity is increased to 7 volts/watt for p-polysilicon and to about volts/watt for n-polysilicon without any appreciable change in the time constant of the detector. Dissert. Abstr.

N82-20397*# National Aeronautics and Space Administration, Washington, D. C.
GENERAL THEORY OF THE DOUBLE FED SYNCHRONOUS MACHINE Ph.D. Thesis - Swiss Technological Univ., 1950
Mohammed G. El-Magrabi Feb. 1982 122 p refs Transl. into ENGLISH of Swiss Thesis 123 p Transl. into Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76633; NAS 1.15:76633) Avail: NTIS HC A06/MF A01 CSCL 09A

Motor and generator operation of a double-fed synchronous machine were studied and physically and mathematically treated. Experiments with different connections, voltages, etc. were carried out. It was concluded that a certain degree of asymmetry is necessary for the best utilization of the machine. Author

N82-20398*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MICROWAVE FIELD EFFECT TRANSISTOR Patent Application
Ho-Chung Huang, (RCA Corp., New York) Filed 4 Dec. 1981 28 p
(NASA-Case-GSC-12442-1; US-Patent-Appl-SN-327659) Avail: NTIS HC A03/MF A01 CSCL 09A

Electrodes of a high power, microwave field effect transistor are substantially matched to external input and output networks. This field effect transistor includes a metal ground plane layer, a dielectric active region on the dielectric layer, and substantially coplanar spaced source, gate and drain electrodes having active segments covering the active region. Many of the devices are connected in parallel and share a common active region, so that each pair of adjacent devices share the same source electrodes and each pair of adjacent devices shares the same drain electrodes. The gate electrodes for the parallel devices are formed by a continuous stripe that extends between adjacent devices and is connected at different points to the common gate pad. NASA

N82-20399*# Mississippi State Univ., Mississippi State. Microelectronics Research Lab.
HIGH DENSITY CIRCUIT TECHNOLOGY Quarterly Report, 13 Oct. 1979 - 13 Jan. 1980
Thomas E. Wade Jan. 1980 22 p refs
(Contract NAS8-33448)
(NASA-CR-161385; NAS 1.26:161385; MSU-EE-QUAR-1-80)
Avail: NTIS HC A02/MF A01 CSCL 09C

Acquisition of polyimide materials for inter-metal dielectrics was obtained from three vendors, with considerable evaluation conducted on the Dupont PI2550 material. Experimental results indicate this material can be patterned using contact printing to line width far below 0.1 mils. Optimum line width is acquired using plasma etch equipment. Metal lift-off experiments on thermal evaporated films were optimized for application to sputtered deposited films. Alternate metal-lift-off experiments are proposed for future investigation. Dry processing equipment studies and future trends in VLSI fabrication techniques are on-going. B.W.

N82-20400*# Auburn Univ., Ala. Dept. of Electrical Engineering.
COST OPTIMIZATION IN LOW VOLUME VLSI CIRCUITS Final Report
Koy B. Cook, Jr. and David V. Kerns, Jr. [1982] 91 p refs
(Contract NAS8-32633)
(NASA-CR-161333; NAS 1.26:161333) Avail: NTIS HC A05/MF A01 CSCL 09C

The relationship of integrated circuit (IC) cost to electronic system cost is developed using models for integrated circuit cost which are based on design/fabrication approach. Emphasis is on understanding the relationship between cost and volume for custom circuits suitable for NASA applications. In this report, reliability is a major consideration in the models developed. Results are given for several typical IC designs using off the shelf, full custom, and semicustom IC's with single and double level metallization. R.J.F.

N82-20401# National Inst. for Aeronautics and Systems Technology, Pretoria (South Africa).
MICROWAVE LINEAR PHASE FILTERS Progress Report
J. H. Cloete Jan. 1981 66 p refs
(NIAST-80/121; ISBN-0-7988-8101-9; PR-3) Avail: NTIS HC A04/MF A01

Experimental determination of coupling between parallel rectangular bars through rectangular quarter-wavelength slots is discussed. Recursive equations for the frequency response calculation of microwave linear phase filters are considered. Group delay measurements on microwave filters are made. Preliminary experimental results on an interdigital linear phase filter are presented. N.W.

N82-20402*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE 1981 GODDARD SPACE FLIGHT CENTER BATTERY WORKSHOP
Gerald Halpert, ed Mar. 1982 544 p Workshop held in Greenbelt, Md., 17-19 Nov. 1981
(NASA-CP-2217; NAS 1.55:2217) Avail: NTIS HC A23/MF A01 CSCL 10C

Results of testing, analysis, and development of lithium, nickel-cadmium, and nickel-hydrogen batteries are reported. Focus is on the improvement of power systems in the areas of high capacity, high energy density, and long cycle and storage life. Applications of these batteries as spacecraft power supplies are discussed. Those spacecraft include deepspace probes, spacecraft in geostationary orbit, and large space systems in low-Earth orbit. For individual titles, see N82-20403 through N82-20446.

N82-20403*# Power Conversion, Inc., Mount Vernon, N. Y.
HIGH RATE, HIGH RELIABILITY Li/SO2 CELLS
R. Chireau *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 15-30 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The use of the lithium/sulfur dioxide system for aerospace applications is discussed. The high rate density in the system is compared to some primary systems: mercury zinc, silver zinc, and magnesium oxide. Estimates are provided of the storage life and shelf life of typical lithium sulfur batteries. The design of lithium cells is presented and criteria are given for improving the output of cells in order to achieve high rate and high reliability. T.M.

N82-20404*# Honeywell Power Sources Center, Horsham, Pa.
ACCELERATING RATE CALORIMETRY: A NEW TECHNIQUE FOR SAFETY STUDIES IN LITHIUM SYSTEMS
Walter B. Ebner *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 31-44 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The role of exothermic reactions in battery test modes is discussed. The exothermic reactions are characterized with respect to their time-temperature and time-pressure behavior. Reactions occuring for any major exotherm were examined. The accelerating rate calorimetry methods was developed to study lithium cells susceptibility to thermal runaway reactions following certain abuse modes such as forced discharge into reversal and charging. T.M.

N82-20405*# Honeywell Power Sources Center, Horsham, Pa.
ALTERNATE SEAL CONFIGURATION FOR LITHIUM PRIMARY CELLS
John A. Kelley *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 45-54 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The problem of glass degradation in the glass-to-metal seals in lithium/sulfur dioxide cells is discussed. The glass degradation mechanism is attributed to lithium reacting with glass which is a result of deposition of lithium at the glass/metal/electrolyte interface. The worst degradation was observed when cells were stored in the inverted position. Alternate sealing methods were examined and a modified Ziegler seal is considered to be one of the best possible methods. The seal consists of a crimp type soft seal using a plastic annulus and a metal tube. Results of degradation tests are presented. T.M.

N82-20406*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
RECENT TEST RESULTS ON LITHIUM BCX CELLS
B. J. Bragg *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 55-75 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Texts included: short circuit analysis, voltage reversal, high temperature exposure, parallel loading sharing, capacity tests, shock and vibration tests, and assembly tests. Both the AA and D cell configurations were tested. Certification of the cells is discussed and applications are highlighted. T.M.

N82-20407*# Central Intelligence Agency, Gaithersburg, Md.
CASE-POSITIVE VERSUS CASE-NEGATIVE DESIGNS FOR LOW-RATE LITHIUM THIONYL CHLORIDE CELLS
Tyler X. Mahy *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 77-90 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Case polarity design choices are discussed. Two examples of case-negative designs are presented. One battery is thionyl chloride limited and the other is lithium limited. The case-positive design is thionyl chloride limited. It is found that the case-positive/case-negative design consideration does not seem to have much bearing on storage. However, during low rate discharge, the case-negative cells show a steadily decreasing capacity as you go to lower and lower rates. T.M.

N82-20408*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HEAT GENERATION RATES IN LITHIUM THIONYL CHLORIDE CELLS
Harvey Frank *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 91-99 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

An empirical equation that is useful for good first approximation in thermal modeling is presented. Indications and measurements of electrochemical heat effects were investigated. The

particular cells of interest are of the D size, with spiral wound configuration and were instrumented with a thermocouple. It is found that cathode limited cells can explode on reversal at moderate temperatures. T.M.

N82-20409*# Altus Corp., San Jose, Calif.
DISCHARGE OF 1400 AH LITHIUM THIONYL CHLORIDE CELLS INTO VOLTAGE REVERSAL
Andrian E. Zolla *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 101-112 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The development of a high energy density battery is discussed. Tests were conducted on a 1400 AH cell and they include: drop tests, crush tests, vibration and shock tests, hydrostatic pressure effects, charge current tests, and discharge tests. None of these tests led to a venting or explosion of the cell. Criteria are presented for extending RV safety of a 1400 AH cell. T.M.

N82-20410*# GTE Labs., Inc., Waltham, Mass.
HIGH-RATE LITHIUM THIONYL CHLORIDE CELLS
Franz Goebel *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 113-122 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

A high-rate C cell with disc electrodes was developed to demonstrate current rates which are comparable to other primary systems. The tests performed established the limits of abuse beyond which the cell becomes hazardous. Tests include: impact, shock, and vibration tests; temperature cycling; and salt water immersion of fresh cells. T.M.

N82-20411*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FACTORS AFFECTING CYCLE LIFE IN AMBIENT TEMPERATURE OF SECONDARY LITHIUM BATTERIES
Robert Somoano *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 123-140 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Three major factors are discussed: electrode integrity, electrolyte stability, and dendrite formation. It is concluded that elastomers can function as improved binders for rechargeable cathodes. The cathodes can retain integrity under long cycle life with no visual deteriorations. It is found that microelectrodes can be made from powdery cathode materials for voltammetry studies. T.M.

N82-20412*# EIC, Inc., Newton, Mass.
PROGRESS IN SECONDARY LITHIUM BATTERIES
Gerhard L. Holleck *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 141-148 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The lithium/molybdenum trisulfide system is discussed. This system has a higher potential energy density than that of lithium/titanium disulfide. Possible energy densities and performance values for cells, projected from preliminary data obtained on small cells, are summarized. The electrode structure is emphasized as an important factor in the decreasing of capacity upon cycling. T.M.

N82-20413*# Army Electronics Research and Development Command, Fort Monmouth, N. J.
ARMY POSITION ON LITHIUM BATTERY SAFETY
Edward Reiss *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 149-156 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

User requirements for lithium sulfur batteries are presented. They include careful analysis of design and quality control, along with certain equipment specifications. Some of the specifications include: hermetically sealed cells; lithium limited cells with stoichiometry of lithium to sulfur dioxide as a ratio of one; low moisture content in the cells; and battery capacity. T.M.

N82-20414*# Naval Surface Weapons Center, White Oak, Md.
NAVY POSITION ON LITHIUM SAFETY
Frank Bis *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 157-163 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The Navy's position on safety of lithium batteries is discussed. Testing includes: short circuit with all fuses bypassed; forced discharge at the fuse value; and a modified incineration test. L.F.M.

N82-20415*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DESTRUCT/NON-DESTRUCT EVALUATION OF CYCLED NiCd CELLS
Salvador DiStefano *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 165-176 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

AC impedance techniques are discussed for a non-destruct analysis of nickel cadmium batteries. A technique for determining battery cycle life is the ultimate goal. L.F.M.

N82-20416*# Villanova Univ., Pa. Dept. of Chemistry.
ELECTROCHEMICAL MODELS FOR THE DISCHARGE CHARACTERISTICS OF THE NiCd CELL
Michael S. Spritzer *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 177-188 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Models are developed and discussed as a technique for evaluating the discharge characteristics of the nickel cadmium battery. Results are compared with available experimental data. L.F.M.

N82-20417*# Rockwell International Corp., Seal Beach, Calif.
NiCd BATTERY FAILURE ANALYSIS
Karl A. Sense *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 189-200 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The failure of a nickel cadmium battery undergoing tests is discussed. Reasons for the complete destruction of the battery while undergoing preparation for thermal vacuum testing are given. L.F.M.

N82-20418*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LIFE PREDICTION MODEL COMPARISONS
Irwin M. Schulmam *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 201-212 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Predictive failure models for nickel cadmium batteries are discussed. Emphasis is given to the McDermott model, the Lander model, and the JPL failure model. L.F.M.

N82-20419*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
NiCd BATTERY CYCLE LIFE PREDICTION EQUATION FOR LOW EARTH ORBIT
Douglas Hafen *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 213-222 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Cycle life analysis of the nickel cadmium battery is given. The life prediction equation is limited to spacecraft in low Earth orbits. L.F.M.

N82-20420*# Rockwell International Corp., Seal Beach, Calif.
TIME-TO-FAILURE ANALYSIS FOR NiCd BATTERIES IN A CPS ORBIT
Karl A. Sense *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 223-236 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Cells operating at five degrees Celcius or less, and going to 60 to 65 percent depth of discharge, were studied as to whether they could achieve a useful working life of 7.5 years in a GPS orbit. The characteristics of various orbits were compared and it

is noted that the GPS orbit experiences only 220 cycles a year and must be treated as a geosynchronous rather than a low Earth orbit. Cell degradation is considered to be the result of both trickle-charge degradation and degradation due to cycling. Time-to-failure values are presented for selected temperatures and depth of discharges. T.M.

N82-20421*# Hughes Aircraft Co., Los Angeles, Calif.
GALILEO BATTERY
Lynn Marcoux *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 237-256 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

A general discussion of the battery requirements for the Galileo probe is presented. Problems arising from mission changes are emphasized. L.F.M.

N82-20422*# Coppin State Coll., Baltimore, Md.
AN IMPROVED EQUATION FOR DISCHARGE VOLTAGE
Patrick McDermott *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 257-269 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

An improved equation for battery discharge voltage was developed. By looking at the voltage discharge curves, some prediction of cell life could be made. L.F.M.

N82-20423*# Aerospace Corp., Los Angeles, Calif.
NiCd CELL REVERSALS DURING RECONDITIONING
Warren Hwang *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 271-284 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

An accelerated battery test with 15 periods of cell reversals during reconditioning was performed. The nature and extent of hydrogen generation was examined, and the effects of reversals on battery performance were determined. L.F.M.

N82-20424*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OAO-C END-OF-MISSION POWER SUBSYSTEM ENGINEERING EVALUATION
Michael Tasevoli *In its* The 1981 GSFC Battery Workshop Mar. 1982 p 285-292 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 09C

The battery performance on both Orbiting Astronomical Observatory missions was excellent. The end-of-mission power subsystem tests on the battery and the solar arrays provides a real-time degradation analysis for these two components. L.F.M.

N82-20425*# General Electric Co., Philadelphia, Pa. Space Systems Div.
DSCS 3 LIFE TEST PROGRESS REPORT
H. E. Thierfelder *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 293-304 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Life test considerations for a spacecraft power supply system, a battery system, designed for synchronous communication satellites for the Defense Satellite Communication System are described. The following equipment specifications considered in the life tests were: the nickel cadmium cells; bus conductors; diodes; battery casings; electric discharges; voltage drops; pressure, and temperature measurements. Battery performance data collected during eclipse periods is presented in tabular form. M.D.K.

N82-20426*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SMM PARALLEL BATTERY OPERATION IN ORBIT
Richard Broderick *In its* The 1981 GSFC Battery Workshop Mar. 1982 p 305-315 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

A parallel battery system for the SMM spacecraft is described. The battery system performance as a function of lifetime over orbit was evaluated. The following equipment performance specifications were examined during a typical orbit: battery current and discharges, voltage limitations, battery temperature variations, and current sensor performance. Tabulated battery performance data is also included. M.D.K.

N82-20427*# Martin Marietta Aerospace, Pasadena, Calif.
RCA SATCOM IN-ORBIT EXPERIENCE: AN UPDATE
David Stewart *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 317-326 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The SATCOM in-orbit battery performance was evaluated. The capacitance and constant current charge rates for each of the three batteries were monitored. A typical eclipse discharge profile was generated and attendant reconditioning recharge conditions were considered. Battery temperatures, pressures, and average battery voltages are presented in tabular form. In-orbit data from monitoring the end of discharge voltage during eclipses, a key performance parameter, are also given. M.D.K.

N82-20428*# Martin Marietta Aerospace, Pasadena, Calif.
UPDATE: VIKING LANDER NiCd BATTERIES. YEAR SIX
A. O. Britting, Jr. *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 327-339 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The performance of NiCd batteries on the Viking Mars landers is discussed. During evaluation, three of the four batteries were maintained in the discharged state. Battery charge regimes and close-together, deep-discharge, reconditioning cycles to retard degradation of batteries are discussed. The effect of elevated temperatures during Martian summer on battery performance were also considered. Tabulated data for average battery capacity as a function of time are given. A design uplink to allow more frequent, greater depth of discharge reconditioning cycles was proposed. M.D.K.

N82-20429*# Rockwell International Corp., Downey, Calif.
GPS ON-ORBIT BATTERY PERFORMANCE
John L. Kasten *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 341-352 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Three batteries designed for the GPS system were evaluated. The batteries were wired together, and during the eclipse period were discharged through parallel diodes into a boost converter which then boosted the battery voltage up to the totally regulated bus voltage. Each battery, with a system life of approximately five years, had its own charger. During testing the battery was maintained or used on trickle charge. Data are presented for the battery capacity during the reconditioning. Raw data for each eclipse period and calculations for the average discharge voltage for each battery are given. Thermal cycling for one of the batteries and reconditioning cycles and regimes for all of the batteries are discussed. A reconditioning discharge curve is also given. The problem of temperature cycling in one of the batteries was resolved by redesigning the battery radiator system. M.D.K.

N82-20430*# Aerospace Corp., Los Angeles, Calif.
NEW NiCd BATTERY STANDARD AND GUIDE
M. J. Milden *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 353-366 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The preparation and contents guides designed to provide specifications and standards for NiCd batteries for space missions are discussed. Requirements were established to assure proper in orbit performance and compliance with handling procedures to minimize degradation. The guides were designed to benefit both industries and the military. The surveys include: reasons given for and against the use of flight batteries in systems tests; use of rechargeable batteries during space vehicle testing; and military standards and specifications. M.D.K.

N82-20431*# Bell Telephone Labs., Inc., Murray Hill, N. J.
EFFECTS OF THE MODE OF STORAGE ON THE CAPACITY FADING OF THE SINTERED NICKEL ELECTRODES
B. Vyes and M. P. Bernhardt *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982

p 367-386 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

A systematic investigation of the effect of temperature and two conditions of storage, shortened and open circuit, on the capacity fading of sintered nickel electrodes in NiCd batteries was conducted. All testing was done on sintered electrodes in flooded cells. Cycling tests to measure the capacity were performed at room temperature. The capacity out to one volt, a capacity useful for satellite applications. Test results indicated that: the shortened electrode showed a higher rate of loss than the open circuit electrodes; there was an increase in both modes with an increase in temperature; there was a loss of capacity with time of storage; a general degradation was observed as a function of time; shortened electrodes showed a higher end of charge than the open circuit ones; and at room temperature there was a lower loss in the open circuit electrode than in the shortened one. M.D.K.

N82-20432*# Communications Satellite Corp., Clarksburg, Md.
SINTERED PLAQUE CHARACTERISTICS
H. Vaidyanathan *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 387-402 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The structural transformations occurring during sintering, the fabrication of a slurry produced sintered plaque, are detailed. Degradation of the positive electrode in performance in cycling in a nickel hydrogen battery were traced to the quality of the sintered plaque. Electrode degradation was found to be a limiting factor in the battery cycle life. Details of microstructural characterization and distribution of pores, examination of plastic flow during shrinkage, and observations of the rounding of nickel powder particles during the slurry process are presented. M.D.K.

N82-20433*# Naval Surface Weapons Center, White Oak, Md.
RECENT DEVELOPMENTS IN THE NSWC COMPOSITE ELECTRODE
W. A. Ferrando *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 403-414 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

A characterization of the physical parameters and life cycle data on nickel composite electrodes was conducted. Attempts to improve the nickel composite electrodes with respect to longevity, light weight, and low cost were made. The physical characteristics of a group of electrodes were examined with emphasis on the porosity of the plaques, the thickness of the electrodes, and the potential presence of electrolytes contamination. It was concluded that the nickel composite electrodes exhibit good life cycle characteristics and that their fabrication seems to present real possibilities for the future as a method of making electrodes that are durable, lightweight, and low cost. M.D.K.

N82-20434*# Aerospace Corp., Los Angeles, Calif.
CORROSION IN NiCd CELLS
Charles Badcock and Jim Galligan (Connecticut Univ.) *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1981 p 415-420 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Corrosion in the terminals of nickel cadmium cells was investigated. Corrosion, crevice type corrosion, at the interface between the stainless steel material, the nickel material, and the braze was examined. It was concluded that in the welded areas there was no problem. There was corrosion of the crevice type in the brazed areas and some pitting was evident between the braze and the base material. M.D.K.

N82-20435*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A METHOD FOR BATTERY ACTIVATION
Gerald Halpert and Michael Tasevoli *In its* The 1981 GSFC Battery Workshop Mar. 1982 p 423-433 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

A technique to activate nickel cadmium batteries is described. The method shortened the time required for activation, eliminated the temperature rise in the batteries, and produced a voltage on the discharge that was better than when the C/20 was run for 48 hours during tests. Various methods of activation are described and evaluated. Results of alternate conditioning charge schemes are presented along with voltage/temperature characteristics for multiple level nickel cadmium battery chargers. M.D.K.

N82-20436*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPARISONS OF DIFFERENT PLATE TREATMENT AND DESIGNS: AN UPDATE
David Baer *In its* The 1981 GSFC Battery Workshop Mar. 1982 p 435-442 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Nine groups of cells were studied. The first group was the control. The basic design was cadmium in the positive plate, and no negative treatment. The plate loading level was the IUE. The separator was pellon. The test regime for the remaining cells was a 90 minute cycle with 40% depth of discharge and a temperature of 20 C. The charge rate was 9.6 amps to a voltage limit. The discharge rate was 9.6 amps. N.W.

N82-20437*# Bowie State Coll., Md.
COMPARISONS OF DIFFERENT PLATE TREATMENTS AND DESIGNS: ANALYSIS
Vasanth Kunigahelli *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 443-458 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The design and process changes on cell performance and life were studied. The merits of each design were analyzed physically, chemically, and electrochemically. A teardown analysis of each cell was carried out. On opening the cell it was found that the cell pack was moist with the electrolyte, the extent varying from one cell to another. The cell components, the positives, the negatives, and the separators, could be separated easily for cell pack of an uncycled cell. The separators from the uncycled cell were clean and white. In the case of cycled cells the separators were stuck to the surface of the negative plates. During the removal of these separators from the negative plates invariably a thin layer of the separator material was strongly adhering to the surface of the negative plates and could not be removed as easily as in the case of the uncycled cells. The separators had dark patches due to cadmium migration. N.W.

N82-20438*# Bell Telephone Labs., Inc., Murray Hill, N. J.
CHARGEABILITY OF NICKEL ELECTRODES STUDIED BY OPTICAL MICROSCOPY
C. K. Dyer *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 459-470 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Some of the operational characteristics of some nickel hydrogen cells are explained. Some strange capacity excursions with cycling were seen. N.W.

N82-20439*# Eagle-Picher Industries, Inc., Colorado Springs, Colo.
POSITIVE ELECTRODE PROCESSING FOR HUGHES NiH2 CELLS
Carol A. Bleser *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 471-480 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The basic procedures were developed for the manufacture of nickel cadmium batteries. An electrochemical impregnation in an aqeuous ethanol solution is used in this process. Several additional controls were instituted for production of flight electrodes, including a Hughes controlled MCD, a solution reserved exclusively for the impregnation of Hughes positive electrodes a system of complete traceability for individual electrodes, an electrical characterization test to provide information on weight and capacity at the plaque level, and a stress test to provide data on capacity, weight, and physical parameters at the electrode level. N.W.

N82-20440*# Communications Satellite Corp., Clarksburg, Md.
COMSAT LABS LIFE TEST DATA FOR NiH2 CELLS

Joseph Stockel *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 481-485 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Data concerning a ten cell nickel hydrogen battery are presented. The plates are electrochemically impregnated using slurry plaque. N.W.

N82-20441*# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
LIFE TEST OF 50 AH NiH2 BATTERY
Don H. Warnoc *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 487-499 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 01C

Life cycle testing on a battery is reported. The cells were built in 1975, put into battery in 1976, and flown in 1977 in low Earth orbit. N.W.

N82-20442*# TRW, Inc., Redondo Beach, Calif.
CYCLING CHARACTERISTICS ON NiH2 CELLS IN STANDARD AND DAILY ENERGY BALANCE LEO ORBITS
Paul Ritterman *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 501-512 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 01C

A plot of end-of-charge and end-of-discharge voltage versus the number of cycles completed, and end-of-charge and end-of-discharge pressure versus cycles completed are presented. N.W.

N82-20443*# Hughes Aircraft Co., Los Angeles, Calif.
SOME PROPERTIES OF NiH2 CELLS
Howard H. Rogers *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 513-524 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Different tests on a flight type cell are discussed. The temperature was measured at the cell flange. The cell was charged to rollover at .75 C rate at 40 degrees C for the first temperature. At that point a voltage reading was taken. Charging was done for an arbitrary ten seconds at .75 C, 30 C, 20 C, 10 C and zero C to obtain momentarily stable voltages. N.W.

N82-20444*# Hughes Aircraft Co., El Segundo, Calif.
NICKEL-HYDROGEN FLIGHT RELAY AND CELL SHORTING TEST
Steven J. Stadnick *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 525-532 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

A relay used on a standard flight configuration of nickel-hydrogen cells is discussed. N.W.

N82-20445*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
NiH2 CELL TEST UPDATE
V. C. Mueller *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 533-545 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

Testing at 9500 cycles on one cell and at 7500 on a second is reported. A third cell failed. N.W.

N82-20446*# Eagle-Picher Industries, Inc., Joplin, Mo.
NICKEL SYSTEM MANUFACTURING UPDATE
Lee Miller *In* NASA. Goddard Space Flight Center The 1981 GSFC Battery Workshop Mar. 1982 p 547-549 (For primary document see N82-20402 11-33)
Avail: NTIS HC A23/MF A01 CSCL 10C

The electrochemical positive electrode was used in nickel hydrogen for six or seven years with very good results, primarily because of the dimensional stability and the high electrical utilization of the active material. N.W.

N82-20447# Indiana Univ. at Bloomington. Dept. of Physics.
THEORY OF SUPERIONIC CONDUCTORS Final Report, 30 Sep. 1976 - 30 Sep. 1981
Gerald D. Mahan Sep. 1981 17 p refs
(Grant AF-AFOSR-3106-76)
(AD-A108638; AFOSR-81-0805TR) Avail: NTIS HC A02/MF A01 CSCL 20/3

Theoretical physics research is reported on several aspects of superionic conductors. Theories of ionic conductivity were developed to explain experiments. The role of ion-phonon interaction was explored by the solution of several mathematical models of ion and electron conduction in many-particle systems. The primary research objective was to understand why some solids have a very high conductivity of ions. Several hundred such materials were identified. Some have usefulness in chemical devices such as batteries. Theoretical physics research into the mechanisms of ion motion in solids was done in an effort to identify why some solids conduct ions well, while others do not. GRA

N82-20448# Army Electronics Research and Development Command, Fort Monmouth, N. J. Electronics Technology/Devices Lab.
A HIERARCHICAL GRAPHIC SOFTWARE PACKAGE FOR DOCUMENTING CIRCUIT DESIGN LAYOUT Final Report
Henry Riebsamen Nov. 1981 41 p
(DA Proj. 1L1-62705-AH-94)
(AD-A109507; DELET-TR-81-20) Avail: NTIS HC A03/MF A01 CSCL 09/3

This paper describes the processing techniques and characteristics of a graphic documentation software package which was developed for plotting hierarchically-modular circuit design layouts using a dot-matrix printer/plotter. This software can be used for other graphic applications as long as the data is supplied in the required descriptive language format. This software package will process modularly partitioned circuits or structures to any nested level and allow accumulative rotation and mirroring (8 orientations) of the modules regardless of nesting level. The software uses design data in RCA's Design File Language and accesses data for the modules from library files using searches on name. If the graphic presentations require more than one page width, multiple segments (pages) are spooled out to the printer/plotter with fiducial reference marks for joining the segments together. Complete integrated circuit layouts may be plotted using either cell outlines or complete cell details. Other options include scaling, rotation, windowing, and shading of polygons. A single mask level may be selected for plotting, if desired. GRA

N82-20449# Stanford Univ., Calif. Dept. of Computer Science.
ON LINEAR AREA EMBEDDING OF PLANAR GRAPHS
Danny Dolev and Howard Trickey (IBM Research Lab., San Jose, Calif.) Sep. 1981 22 p refs
(Contract MDA903-80-C-0102; Grant NSF MCS-80-12907)
(AD-A109603; SU-STAN-CS-81-876) Avail: NTIS HC A02/MF A01 CSCL 12/1

Planar embedding with minimal area of graphs on an integer grid is one of the major issues in VLSI. Valiant (V) gave an algorithm to construct a planar embedding for trees in linear area; he also proved that there are planar graphs that require quadratic area. An algorithm to embed outerplanar graphs in linear area is given. This algorithm is extended to work for every planar graph that has the following property: for every vertex there exists a path of length less than K to the exterior face, where K is a constant. Finally, finding a minimal embedding area is shown to be NP-complete for forests, and hence more general types of graphs. GRA

N82-20450# Thomas Electronics Inc., Wayne N. J.
MANUFACTURING METHODS AND TECHNOLOGY (MM&T) SPECIFICATIONS FOR MINIATURE CATHODE RAY TUBE Quarterly Report, 1 Apr. - 30 Jun. 1981
F. M. Bruno 31 Jul. 1981 16 p
(Contract DAAK70-80-C-0168)
(AD-A109711; TEI-A009-3; QR-3) Avail: NTIS HC A02/MF A01 CSCL 09/1

TEI placed a hold on fabrication of the 2nd Submission of two Phase I - Engineering Samples until the following EM and vendor problems could be resolved: test of prototype yokes; funnel shield and neck shield maximum allowable concentricity; blemish size and quantity requirement; qualification and reliabil-

ity test procedures; sensitivity and linearity requirements; focus voltage requirement; and brightness contrast ratio. The status of materials not previously on hand at TEI improved during the reporting period. Author (GRA)

N82-20451# TRW Defense and Space Systems Group, Redondo Beach, Calif.
SATELLITE 9443 DSCS 2 ANOMALY REPORT: NARROW COVERAGE DOWNLINK NOISE Final Report
A. P. Fay 14 Aug. 1981 52 p
(Contract F04701-80-C-0022)
(AD-A109723; TRW-36060-AR-024-01; SD-TR-81-98) Avail: NTIS HC A04/MF A01 CSCL 09/1

Results are given of an investigation of the cause of noise pulses in the RF downlink, considering orbital data and laboratory simulation. The cause is ascribed to an arc in the cathode circuitry of the TWT, which is a function of the vacuum level. GRA

N82-20452# Bendix Corp., Kansas City, Mo.
COMPUTER-AIDED LAYOUT OF HYBRID MICROCIRCUITS Final Report
J. R. Williams Sep. 1981 9 p refs
(Contract DE-AC04-76DP-00613)
(DE82-000822; BDX-613-2670) Avail: NTIS HC A02/MF A01

The feasibility and cost effectiveness of acquiring a computer aided layout design capability for hybrid microcircuits were investigated. Both internal and external sources for the capability are considered. It is determined that such a capability is cost effective under current conditions. DOE

N82-20453# Bendix Corp., Kansas City, Mo.
DRAG SOLDER PROCESS EVALUATION
R. C. Harnden and R. C. Douglass Oct. 1981 18 p refs
(Contract DE-AC04-76DP-00613)
(DE82-002431; BDX-613-2671) Avail: NTIS HC A02/MF A01

An evaluation established yields from the current drag soldering process, and identified sources for defects originating within which can be used to achieve improved process control techniques and identify design and fabrication parameters. Two printed wiring assemblies were selected for evaluation. Printed wiring assemblies were submitted to inspection immediately after the drag soldering operation without benefit of work verification and touch-up by manufacturing personnel that normally would be provided in the standard process. Ninety printed wiring assemblies of one design and 113 of the other were inspected over a 5-month period. The results of this evaluation revealed a solder joint defect rate of approximately 0.25%. However, because of the complexity of the assemblies, this defect rate equated to an average of 1.5 solder defects per assembly. Only 28% of the assemblies were defect free. Although the solder joint defect rate is low, the cost of identifying and repairing these defects can be significant because of the low assembly yield at first part inspection. DOE

N82-20454# Royal Signals and Radar Establishment, Malvern (England).
AN EXPERIMENTAL STUDY OF ORTHOMODE COUPLERS FOR USE IN POWER COMBINING AND DISTRIBUTION
J. Clarke and D. J. Cracknell (Marconi Res. Labs.) London Sep. 1980 17 p refs
(RSRE-MEMO-3290; BR76277) Avail: NTIS HC A02/MF A01

The rotary switch is the combination of two orthomode couplers such that the effective angular displacement of the couplers controls the power flow from the two input ports to the designated output port. The operation of the device depends entirely on the scattering matrix of an orthomode coupler. The assembly consists of two identical ends in circular waveguide, which may be effectively rotated with respect to each other about the longitudinal axis by rotation of the half-wave plate. A half-wave plate provides differential phase shift of pi to the two principal polarization planes. A 3 GHz device was tested over a range of power levels up to 500 kW peak on an S-band magnetron test set; the phase shifter vane was set at 0 deg. No breakdown occurred. Author (ESA)

N82-20455# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany). Preprojects and Studies Dept.
MIC: MATERIAL AND CIRCUIT EVALUATION FOR MILLIMETER WAVE APPLICATIONS Final Report
F. Arndt, J. Bornemann, D. Grauerholz, R. Vahldieck, U. Christ, and H. Stolze Paris ESA Feb. 1981 209 p refs Prepared in cooperation with Bremen Univ., West Germany
(Contract ESA-4044/79/NL-DG(SC))
(TR-MIC1/A1; PRV-3; ESA-CR(P)-1508) Avail: NTIS HC A10/MF A01

Surface roughness, dielectric constant, quality factor, and loss were measured and a literature survey was conducted to determine materials and circuits suitable for microwave application. The best materials found are RT/Duroid, Rexolite, Polyguide, SiO_2, and Al_2O_3. Fin line, dielectric image line, microstrip line, slot line, waveguide coplanar line, and suspended substrate line are suitable circuits, as shown by the performance of 2 high Q fin line filters up to 33.7 GHz, 3 microstrip 3 dB-hybrid couplers up to 28.3 GHz, a fin line mixer up to 40 GHz, and a fin line printed probe coupler for 31.3 GHz. The design theory for high Q fin line filters is given, including the higher order mode propagation. The measured results vefify the theory. Two of the circuits built were successfully vibration tested. Author (ESA)

N82-20456 Pennsylvania Univ., Philadelphia.
VELOCITY DISTRIBUTIONS OF INTENSE Pb MOLECULAR BEAMS Ph.D. Thesis
Edwin Louis Gerber 1981 174 p
Avail: Univ. Microfilms Order No. 8127025

An apparatus was built to measure the time of flight (TOF) distribution of Pb molecules in a molecular beam. A rotating chopper was utilized to produce a pulse of molecules and an electron beam ionization detector to measure the flight time of the molecules. Lead beams were measured at 0.000001 torr as the source/chopper distance was varied from 3.0 to 7.3 cm. The beam's temperature was determined via a collision dominated beam model. Analysis of results shows that the beam temperature varies with the source/chopper distance as the log of the beam temperature is approximately -2 (log of the source/chopper distance + C) that the Pb atoms in the hot beam can be considered an ideal gas with negligible van der Waals forces. Also in beam dynamics obeyed a reversible adiabatic process with gamma (the specific heat ratio) = 1.65 approaches 1.69. Dissert. Abstr.

N82-20216# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
DIGITAL ATTITUDE AND ORBIT CONTROL ELECTRONICS FOR LONG-LIFE COMMUNICATION SATELLITES
Michael Wlaka *In* AGARD Spacecraft Pointing and Position Control Nov. 1981 7 p refs Sponsored in part by DFVLR-BPT
(For primary document see N82-20208 11-12)
Avail: NTIS HC A12/MF A01

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N82-20457 Illinois Univ. at Urbana-Champaign.
THERMAL INSTABILITY OF WEDGE FLOWS Ph.D. Thesis
Kuan Chen 1981 204 p
Avail: Univ. Microfilms Order No. 8127564

Thermal instability of wedge flow boundary layers over a heated surface, including those of stagnation flows, was investigated. These flows were studied because they serve as the prototypes of general forced convection boundary layers in heat transfer. Attention was focused on the streamwise vortex made. The problem was reduced to an eight-order eigenvalue problem with four parameters: the Prandtl number, the wedge parameter, and Rayleigh and wave numbers based on a suitable boundary layer thickness. Two numerical methods of solution, both based on the shooting method were developed for solving

the eigenvalue problem for a semi-infinite domain. Neutral stability curves of Rayleigh number versus wave number are presented for wedge angles. Results suggest that thermal instability is only sensitive to the thermal structure of the boundary layer, and is quite insensitive to the details of the velocity distribution, except in terms of the latter's influence on the thermal boundary layer thickness. Dissert. Abstr.

N82-20458 Illinois Univ. at Urbana-Champaign.
INVESTIGATION OF THERMOCAPILLARY FLOWS AROUND HEMISPHERICAL BUBBLES Ph.D. Thesis
Jose Maria Saiz Jabardo 1981 295 p
Avail: Univ. Microfilms Order No. 8127611

Transient thermocapillary induced flows around a hemispherical bubble on a heated wall were studied using numerical solutions for a wide range of Marangoni numbers. Natural convection effects and mass transfer at the bubble interface were included. Two distinct boundary conditions were examined: constant wall heat flux and constant wall temperature. A second order finite difference scheme was adopted for the diffusion terms in the governing equations, while stable upwind schemes were used for the nonlinear convective terms. The elliptic stream-function was determined by a relaxation technique. Numerical diffusion effects were also investigated. No significant heat transfer improvement was evident, even for Marangoni number as high as 200,000. The mass transfer process at the bubble interface reduces significantly the thermocapillary activity. High order buoyancy effects tend to cancel thermocapillarity for downstream facing bubbles. Natural convection is the dominant mechanism for an upward facing bubble. Dissert. Abstr.

N82-20459 Michigan Univ., Ann Arbor.
TWO-DIMENSIONAL BUOYANT JETS IN A STRATIFIED OR CROSSFLOWING AMBIENT FLUID Ph.D. Thesis
Roger Bruce Wallace 1981 314 p
Avail: Univ. Microfilms Order No. 8125217

A two dimensional buoyancy jet, discharged vertically into an ambient fluid, is studied. Two ambient influences are considered: a linear stratification; and a cross flow velocity. The gross characteristics of the effluent field, produced when the ambient fluid is stratified, are determined. These are: the maximum rise; the location and thickness of effluent spreading from the jet; and the minimum dilution of effluent and its location in the spreading layer. Simple equations are developed with dimensional analysis; each describes one gross characteristic as a function of a stratification parameter, the source flux of either momentum or buoyancy, and an unknown constant. Experiments verify the equations, provide the constants, and determine when each equation best approximates buoyant jet behavior. The results are compared to estimates made using the integral equations. Dissert. Abstr.

N82-20460 Illinois Univ. at Urbana-Champaign.
EXAMINATION OF FLUID-PARTICLE IN TURBULENT, NON-DILUTE, PARTICLE SUSPENSION FLOW Ph.D. Thesis
Roberaldo Carvalho De Souza 1981 172 p
Avail: Univ. Microfilms Order No. 8127697

Theoretical modeling and experimental studies of particles suspended in fully developed turbulent water flow in a vertical pipe (I.D. = 18.4 cm) were conducted. An analytical model was developed to predict the stochastic motion of particles in a non-dilute turbulent suspension flow. The model, incorporates hydrodynamic interaction between particles over a range of particle volume loadings and turbulent particle Reynolds numbers. The mean free fall velocity of the particles was determined and the phenomenon of cluster formation was observed. The precise volume loading which gives the maximum relative settling velocity was observed to depend on particle density and size. Turbulent drag coefficients at various volume loadings were compared with several models and correlations in the literature. Particle dispersion was found to be sensitive to particle volume loading. Dissert. Abstr.

N82-20461 West Virginia Univ., Morgantown.
COORDINATE SYSTEM GENERATION FOR INTERNAL FLOW PROBLEMS VIA SCHWARZ-CHRISTOFFEL TRANSFORMATION Ph.D. Thesis
Kathleen Prouty Sridhar 1981 137 p
Avail: Univ. Microfilms Order No. 8127831

Accurate grid generation for complex internal flow geometries is explored. Numerical integration of Schwarz-Christoffel transformations for both polygonal and curved surfaces is used. Singularities which occur in the transformation at corners are analytically addressed, and the affects of this treatment on the mapping accuracy are presented. The transformation for curved elements is also described, and the consistency of the assumptions of the method with the accuracy of the integration scheme is discussed. The method shows second order accurately for surfaces described by polygonal elements and fourth order accurately for surfaces described by curved elements. Several calculations related to the mapping procedure are presented. The method directly provides the two dimensional incompressible potential flow solution as well as a simple relation for calculating the grid metric coefficients. Dissert. Abstr.

N82-20462 Minnesota Univ., Minneapolis.
FLUIDS IN POROUS MEDIA: TWO-PHASE DISTRIBUTION AND FLOW Ph.D. Thesis
Kishore Kumar Mohanty 1981 359 p
Avail: Univ. Microfilms Order No. 8125994

A microscopic or pore level theory for distribution and flow of two immiscible fluids in a porous medium is described. The essential elements of physics are identified and combined with the key features of pore morphology. A porous medium is an interpenetrating network of void space and solid matrix. For multiphase distribution and flow in such a medium the most important morphological features are its connectivity, or topology, which can be described by an equivalent network, and its throat body relationship, or geometry, which can be represented by assigning a characteristic radius to each point on pore wall. Given a porous medium, it can be reduced systematically to a network that preserves the essential morphological features. Dissert. Abstr.

N82-20463 British Library Lending Div., Boston Spa (England).
FLOW STABILITY IN EVAPORATORS OF FORCED FLOW STEAM GENERATORS
F. Thelen 17 Sep. 1981 31 p Transl. into ENGLISH from VGB Kraftwerkstechnik (West Germany), v. 61, no. 5, May 1981 p 357-367
(BLL-Dounreay-Tran-886(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

When raising steam in forced flow boilers the extent of the temperature differences found in practice cannot fully be explained because of the large number of possible perturbation values of which neither the extent nor their permutations are known. A new method of calculation was introduced to estimate the sensitivity of evaporators using the characteristic curves for stability and flow rate variation. The certainty of the interpretation was improved. The consequences of construction features for improving the operating conditions for optimum pressure drop efficiency were calculated. The basis for the determinations made came from previous studies of the behavior of evaporators, the flow ratios for forced flow boilers. M.D.K.

N82-20464*# National Aeronautics and Space Administration, Washington, D. C.
PRESSURE LOSSES AND HEAT TRANSFER IN NON-CIRCULAR CHANNELS WITH HYDRAULICALLY SMOOTH WALLS
J. Malak Feb. 1982 101 p refs Transl. into ENGLISH of Rept. UJV-2891-R Ceskoslovenska Akad. Ved (Prague) Sep. 1972 120 p Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3101)
(NASA-TM-76670; NAS 1.15:76670; UJV-2891-R) Avail: NTIS HC A06/MF A01 CSCL 20D

The influence of channel geometry on pressure losses and heat transfer in noncircular channels with hydraulically smooth walls was studied. As a basic assumption for the description of this influence, integral geometrical criteria, selected according to experimental experience, were introduced. Using these geometrical criteria, a large set of experimental data for pressure losses and heat transfer in circular and annular channels with longitudinal

fins was evaluated. In this way it as empirically proved that the criteria described channel geometry fairly well. S.L.

N82-20465*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
APPARATUS AND METHOD FOR JET NOISE SUPPRESSION Patent Application
Lucio Maestrello, inventor (to NASA) Filed 3 Jun. 1981 25 p (NASA-Case-LAR-11903-2; US-Patent-Appl-SN-238791) Avail: NTIS HC A02/MF A01 CSCL 20D

A method and apparatus for jet noise suppression through control of the static pressure of the jet and control of the rate of entrainment of ambient fluid into the jet downstream of the exhaust nozzle is discussed. In addition, the momentum flux over an extended region of the jet is regulated. Reynolds stresses and the spreading angle of the jet are affected. Static pressure is controlled through a long hollow, porous nozzle plug centerbody which may be selectively vented to ambient conditions, connected to a vacuum source, or supplied with fluids of various densities for injection into the stream. Additionally, sound in the jet may be channeled along the nozzle plug centerbody by injecting coolant such as a cryogenic fluid through the centerbody into the jet. NASA

N82-20466*# National Aeronautics and Space Administration, Washington, D. C.
DETERMINATION OF SURFACE TENSION AT THE PHASE INTERFACE
Ye. I. Dobychin Feb. 1982 9 p refs Transl. into ENGLISH from Izv. Ser. Fiz. i Tekhn. Nauk (USSR), no. 6, 1971 p 67-71 Original language document was announced as A72-22678 Transl. by Scientific Translation Service, Santa Barbara, Calif. Original doc. prep. by Akademiia Nauk Latviyskoy SSR
(Contract NASw-3542)
(NASA-TM-76641; NAS 1.15:76641) Avail: NTIS HC A02/MF A01 CSCL 20D

A method was developed for determining the surface tension coefficient at the interface of two immiscible liquids or of a gas and a liquid. Basic in this method is the measurement of the capillary rise of a droplet of one of the phases placed on the surface of the other phase. It is shown that the capillary rise is a function of the surface energy of the droplet and the viscous friction of the phases. A mathematical model of the dynamics of a liquid droplet is supported by experiments. A.R.H.

N82-20467*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLOW THROUGH ALIGNED SEQUENTIAL ORIFICE TYPE INLETS
Robert C. Hendricks and T. Trent Stetz Mar. 1982 53 p refs (NASA-TP-1967; E-682; NAS 1.60:1967) Avail: NTIS HC A04/MF A01 CSCL 20D

Chocked flow rate and pressure profile data were taken and studied for configurations consisting of four axially aligned, sequential orifice inlets of 0.5 length diameter ratio with separation distances of 0.66 and 32 diameters. A flow coefficient - reduced temperature plot represents the flow rate data for the two cases. At a separation distance of 32 diameters the pressure profiles dropped sharply at the entrance and partially recovered within each orifice - the exception being at low temperatures, where fluid jetting through the last orifice occurred. At a separation distance of 0.66 diameter fluid jetting was prevalent at the lower inlet temperatures. These results are in qualitative agreement with data for four axially aligned, sequential Borda inlets and for tubes with single sharp edge orifice or Borda inlets to L/D's of 105 and with a water flow visualization study. S.L.

N82-20468# Northrop Corp., Hawthorne, Calif. Aircraft Div.
VORTEX FLOW CORRELATION Final Report, May - Oct. 1980
Gary E. Erickson Wright-Patterson AFB, Ohio AFWAL Jan. 1981 357 p refs
(Contract F33615-80-C-3024; AF Proj. 2307)
(AD-A108725; NOR-80-152; AFWAL-TR-80-3143) Avail: NTIS HC A16/MF A01 CSCL 14/2

Key parameters have been identified which permit correlation of vortex flow simulations in a water tunnel with wind tunnel and flight data. Vortex generation, vortex sheet and core location, and a vortex strength on thin slender wings are accurately represented in a water tunnel due to the insensitivity of separation point location to changes in Reynolds number. The fact that theoretical methods which ignore viscous effects can reasonably predict vortex flow aerodynamics is one indication of the Reynolds number insensitivity of these flow phenomena. For wings and bodies where separation point varies with Reynolds number, the fundamental vortex structure is similar regardless of Reynolds number value since vortices at a distance from the generating surfaces are embedded in essentially irrotational flow. External pressure gradient is an important parameter affecting vortex stability and, although there is yet no theoretical verification that this parameter is the dominant one, vortex burst at higher angles of attack for a given configuration occurs at comparable positions in water tunnels as in wind tunnels and flight. A water tunnel is a powerful diagnostic tool capable of providing high-quality flow visualization of complex fluid flows and insight into the phenomenological aspects of vortex generation, interactions between multiple vortices and aerodynamic surfaces and vortex burst. GRA

N82-20469# New York Univ., N. Y. Dept. of Applied Science.
NONLINEAR INSTABILITIES AND LARGE SCALE STRUCTURES IN MIXING LAYERS Final Report, May - Sep. 1980
Roberto Vaglio-Laurin and N. S. Liu Sep. 1981 79 p refs Submitted for publication
(Grant AF-AFOSR-0184-80; AF Proj. 2307)
(AD-A109077; NYU/DAS-81-06; AFOSR-81-0854TR) Avail: NTIS HC A05/MF A01 CSCL 20/4

The dynamics of the large scale structures/vorticity concentrations observed in two dimensional transitional and turbulent mixing layers are described in terms of a nonlinear inviscid two dimensional instability model. According to the model, the formation and repetitive pairing of the structures reflect a deterministic cyclic mechanism wherein the nonlinear evolution of the finite amplitude instability, which dominates the flow at y one stage, intrinsically provides first excitation of, and then energy transfer to, the bound 1/2 subharmonic. The key to identifying and modeling the mechanism resides in a realistic description of the concurrent changes in the mean flow and in the structure of the wave motion during the amplification, saturation and subsequent modulation of the individual nonlinear instability. Models based on weakly nonlinear stability theory prove inadequate to this task. The cause of the failure is identified, and attendant criteria for estimating the applicability of the theory to the present as well as other problems are indicated. GRA

N82-20470# Science Applications, Inc., Wayne, Ind. Applied Mechanics Operation.
PERFORMANCE TECHNOLOGY PROGRAM (PTP-S 2). VOLUME 12: COUPLING OF THE CM3DT INVISCID NOSETIP FLOW FIELD CODE TO THE QUICK GEOMETRY AND STEIN AFTERBODY CODES Final Report, Mar. - Jun. 1980
Darryl W. Hall and Catherine M. Dougherty Jun. 1980 28 p refs
(Contract F04701-77-C-0126)
(AD-A108850; SAI-067-81R-014-Vol-12; BMO-TR-81-72-Vol-12) Avail: NTIS HC A03/MF A01 CSCL 16/3

The CM3DT inviscid blunt body code is modified to include the QUICK geometry description routine. A procedure is developed to couple the CM3DT code to the STEIN inviscid afterbody code. Instructions for the use of the modified CM3DT code with the QUICK and STEIN codes are included. Author (GRA)

N82-20471# Science Applications, Inc., Wayne, Ind. Applied Mechanics Operation.
PERFORMANCE TECHNOLOGY PROGRAM (PTP-S 2). VOLUME 14: EXTENSIONS TO THE 3DSAP APPROXIMATE INVISCID FLOW FIELD CODE Final Report, Sep. 1980 - Feb. 1981
Darryl W. Hall and Catherine M. Dougherty Feb. 1981 53 p refs
(Contract F04701-77-C-0126)
(AD-A108851; SAI-067-82R-006-Vol-14; BMO-TR-81-Vol-14)

Avail: NTIS HC A04/MF A01 CSCL 16/3

The 3DSAP approximate inviscid flow field technique has been modified to permit treatment of flared multi-conic afterbodies. The calculation of the flared afterbody section is performed using a discrete shock-fitting algorithm to accurately treat the embedded shock. Additional modifications have been incorporated into the code, allowing stretching of the body-normal coordinate grid and improving the treatment of expansion discontinuities on the multi-conic frustum. GRA

N82-20472# Massachusetts Inst. of Tech., Cambridge. Dept. of Ocean Engineering.

EXPERIMENTAL METHODS FOR THE PREDICTION OF THE EFFECT OF VISCOSITY ON PROPELLER PERFORMANCE Ph.D. Thesis

Sukeyuki Kobayashi Jun. 1981 155 p refs

(Contract N00014-76-C-0357; SR0090101)

(AD-A109846; OE-81-7) Avail: NTIS HC A08/MF A01 CSCL 13/10

A Laser Doppler Velocimeter (LDV) was used to perform a propeller wake survey for DTNSRDC propellers 4381 and 4383. Three components of the velocity were measured and from this, the velocity field and the vorticity field were constructed. Through a coordinate transformation, the vorticity field was separated into two parts i.e., trailing vorticity and boundary layer type vorticity in the viscous wake. The data was used for the prediction of propeller blade profile drag (viscous sectional drag). The idea of hypothetical flow by Betz was extended to propeller flow and a formula for the profile drag was derived in terms of velocities, which is suitable for LDV application. The radial distribution of profile drag was computed using the velocity data. It was shown that the value of Cd is close to that of 2-dimensional section at mid-radius range, but becomes substantially lower at inner and outer radii and that it goes up again near the tip and the hub. This trend is consistent with the behavior of profile drag of a finite span wing. Author (GRA)

N82-20473# Edinger (John E.) Associates, Inc., Wayne, Pa.

ESTUARINE LATERALLY AVERAGED NUMERICAL DYNAMICS: THE DEVELOPMENT AND TESTING OF ESTUARINE BOUNDARY CONDITIONS IN THE LARM CODE Final Report

John E. Edinger and Edward M. Buchak Vicksburg, Miss. Army Engineer Waterways Experiment Station Nov. 1981 92 p refs

(Contract DACW21-80-C-0042)

(AD-A109712; WES-MP-EL-81-9) Avail: NTIS HC A05/MF A01 CSCL 20/4

The longitudinal and vertical hydrodynamics and transport in stratified waterbodies as formulated for the Corps of Engineers Laterally Averaged Reservoir Model (LARM) have been transformed to estuaries by development of appropriate boundary conditions. The resulting computational code Laterally Averaged Estuary Model (LAEM) is tested on the Potomac River estuary for a short period of time with intensive field data. The estuary problem was formulated in terms of spatially varying geometry, a time-varying tide height and salinity distribution at the mouth, and freshwater inflow. The LARM code was found to reproduce overall estuarine dynamics including tide heights, tide phase shifts, and salinity distributions. In addition, detailed time-varying vertical velocity profiles were produced to a high degree of resolution. Detailed results of the model including the distribution of vertical velocities and turbulent dispersion coefficients were compared to those expected for a coastal plain estuary with favorable agreement. Author (GRA)

N82-20474# Air Products and Chemicals, Inc., Allentown, Pa.

GAS/SLURRY FLOW IN COAL LIQUEFACTION PROCESSES (FLUID DYNAMICS IN 3-PHASE FLOW COLUMNS) Quarterly Technical Progress Report, 1 Oct. - 31 Dec. 1980

David H. S. Ying, R. Sivasubramanian, and Edwin N. Givens Feb. 1981 41 p refs

(Contract DE-AC22-79ET-14801)

(DE82-002562; DOE/ET-14801/15) Avail: NTIS HC A03/MF A01

The need for additional data on behavior of three phase systems in large vessels was addressed. Parameters are investigated at conditions that relate directly to the projected demonstration plant operating conditions. Air/water/sand three phase flow system in both a 5 inch diameter and a 12 inch diameter column is used in this cold flow simulation program. The type of distributor used does not seem to affect the solids distribution profiles. The amount of solids retained in the column increases linearly with decreasing slurry velocity while changes in linear gas velocity does not affect the solids distribution profiles for the conditions studied. It is indicated that withdrawing solids from the bottom of the column results in a decreased amount of solids in the column and the solids concentration profile changes accordingly. It is shown that large particles were preferentially removed by virtue of their faster settling rate. The effects of settled particles and particle/particle interaction on solids accumulation were investigated. It it indicated that the presence of large particles does not influence the accumulation or distribution of fine particles. The column enclosure was completed and tested to identify the organic liquid/liquid which is to be used in the 12 inch diameter column. DOE

N82-20475# Bonneville Power Administration, Portland, Oreg. Mechanical Section.

HEAT PUMP WATER HEATER: MIDWAY RESIDENTIAL COMMUNITY Final Report

J. R. Aguilar and Jon R. Biemer Oct. 1981 63 p refs Sponsored by DOE

(DE82-003548; DOE/BP-53) Avail: NTIS HC A04/MF A01

A prototype heat pump water heater was tested. Five heat pump water heaters were installed in a residential community at Midway, Washington, and their performance was monitored between September 1979 and January 1981. The objectives of the project were to evaluate performance, to assess equipment reliability, and to determine energy savings. Results were also used to assess the heat pump water heater's potential contribution to energy conservation in the Pacific Northwest. The coefficient of performance (COP) and energy savings compared to an electric resistance water heater are 1.66 and 40%, respectively. Because the COP of a heat pump water heater varies with the ambient temperature, performance of a unit affected by seasonal and climatic variation. The energy savings of individual heat pump water heaters will vary from 41 to 56% in the Pacific Northwest, depending on climatic conditions. DOE

N82-20476# United Technologies Research Center, East Hartford, Conn.

PARAMETRIC PERFORMANCE STUDIES ON FLUIDIZED-BED HEAT EXCHANGERS Quarterly Technical Progress Report, 28 Jul. - 30 Sep. 1981

R. C. Stoffler 29 Oct. 1981 9 p refs

(Contract DE-AC22-81PC-40280)

(DE82-002124; DOE/PC-40280/T1; R81-915729-3) Avail: NTIS HC A02/MF A01

The performance of single and multistage shallow fluidized beds for possible application to the recovery of heat from sources as waste heat, and coal combustion or coal gasification were investigated. The following tests are investigated: (1) the effects of fouling due to liquid condensate in the gas stream of fluidized beds which are staged using baffle plates; and (3) the effects of different heat exchanger surface geometries. The conditions fouling by a liquid condensate are selected. Modifications are made to the fluidized bed heat exchanger facility for the fouling experiments. DOE

N82-20477 North Carolina State Univ. at Raleigh.

HEAT TRANSFER IN AXIALLY CONDUCTING FLOW AND PERIODICALLY CONTACTING SOLIDS Ph.D. Thesis

Brian Vick 1981 154 p

Avail: Univ. Microfilms Order No. 8128558

The effects of axial heat conduction on the temperature distribution and local Nusselt number in a fluid for forced convection in a circular tube subjected to various boundary conditions are investigated theoretically. Fully developed laminar flow inside a tube with an insulated upstream region followed by a uniformly heated downstream region. Two independent analytical methods are developed for the solution of this problem. The techniques are extended to solve problems with convective boundaries for the upstream and downstream regions. The cases of both a laminar and slug flow velocity model are considered. The results show that the axial heat conduction in the fluid

significantly effects the bulk and wall temperatures and local Nusselt number in the thermal entrance region, with the effects becoming more pronounced at lower Peclet numbers. Also the results obtained with convective boundary conditions show that the external heat transfer coefficients significantly effect the temperature distribution, and hence the Nusselt number, in the thermal entrance region. Dissert. Abstr.

N82-20478# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
A FURTHER COMPILATION OF COMPRESSIBLE BOUNDARY LAYER DATA WITH A SURVEY OF TURBULENCE DATA
H. H. Fernholz (Technische Univ., Berlin), P. J. Finley (Imperial Coll. of Science and Technology, London), and V. Mikulla Nov. 1981 219 p refs
(AGARD-AG-263; ISBN-92-835-1404-1) Avail: NTIS HC A10/MF A01

Data compiled for nominally two dimensional compressible shock-free flows was supplemented by further data including some shock-boundary-layer-interactions. A review of the available turbulence measurements is presented. The measurements were compared on the basis of inner and outer region similarity relationships. There was little evidence of any quantitative correlation between different experiments. There was also an examination of the breakdown conditions for the Van-Driest/Crocco mean flow temperature-velocity correlation and the associated transformation procedures. The effects of extreme transverse curvature on the mean flow are briefly considered. For individual titles, see N82-20479 through N82-20483.

N82-20479# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
HOT WIRE ANEMOMETRY IN COMPRESSIBLE TURBULENT BOUNDARY LAYERS
In its A Further Compilation of Compressible Boundary Layer Data With a Survey of Turbulence Data Nov. 1981 12 p refs (For primary document see N82-20478 11-34)
Avail: NTIS HC A10/MF A01

Hot-wire anemometry in compressible flow was studied. New techniques for the measurement of turbulence in compressible flows with thermal sensors are described. The greatest amount of information about fluctuating flow variables as achieved using the newly developed sensors and techniques in conjunction with the classical hot-wire mode diagram method. It was found that the hot wire has no fundamental handicap for accurate high speed turbulence measurements in non-separated boundary layers outside the immediate wall region. It was also known that extreme overheating of a supported sensors leads to advantages in simplicity and accuracy of measurements of turbulent fluctuations over the full Mach number range. M.D.K.

N82-20480# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TURBULENCE DATA: SINGLE COMPONENTS
In its A Further Compilation of Compressible Boundary Layer Data With a Survey of Turbulence Data Nov. 1981 17 p refs (For primary document see N82-20478 11-34)
Avail: NTIS HC A10/MF A01

Measurements of three normal stress distributions in subsonic and supersonic boundary layers were made. It was found that the standard reference measurement remains the zero pressure-gradient subsonic boundary layer. The velocity fluctuations, density, temperature and mass flux fluctuations in compressible boundary layers were studied. The turbulence structure changes as a result of effects of compressibility were investigated, in boundary layers both with and without heat transfer. The effect of pressure gradients and shock interactions on the turbulence were studied. The Reynolds number, Mach number, heat transfer normal and tangential shear stresses, and the kinetic energy of the fluctuating motion were studied. The shape and range of the energy spectrum between the subsonic and supersonic boundary layer was also investigated. Tables listing investigations in which measurements of single components fluctuating quantities are presented. It was found that the fluctuating velocities were made dimensionless with one of three velocities, the velocity at the outer edge of the boundary layer, the skin friction velocity or the local mean velocity. M.D.K.

N82-20481# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
TURBULENCE DATA: TWO COMPONENT TERMS
In its A Further Compilation of Compressible Boundary Layer Data With a Survey of Turbulence Data Nov. 1981 19 p refs (For primary document see N82-20478 11-34)
Avail: NTIS HC A10/MF A01

Investigations of the behavior of two-component correlations shear-stress component and heat flux, for compressible turbulent boundary layers were made. Important parameters as Mach number, pressure gradient, heat transfer, Reynolds number, free-stream turbulence, wall roughness, such and wall curvature on the turbulence structure and especially on the shear stress distribution of compressible boundary layers were studied. The relatively few two-component correlation measurements with the main emphasis on the Reynolds shear stress component are discussed. M.D.K.

N82-20482# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
MEAN FLOW TOPICS
In its A Further Compilation of Compressible Boundary Layer Data With a Survey of Turbulence Data Nov. 1981 12 p refs (For primary document see N82-20478 11-34)
Avail: NTIS HC A10/MF A01

A proper practical assessment of the breakdown conditions for the van Driest temperature/velocity correlation and the associated transformation procedures in turbulent boundary layers was made. The effect of wall curvature in the transverse (cross-sectional) and in the longitudinal (camber) direction, on compressible turbulent boundary layers was studied. The boundary layer was formed on the outer surface of one of a number of slender cylinders aligned with the flow. For the subsonic tests two models were used. The first (series 01) consisted of an aluminum tube 3.65 m long and 25.4 mm in diameter. The front end was mounted on the tunnel settling chamber screens so that it extended along the contraction center line into the working section. The second model (series 02) consisted of a steel wire under tension passing through the screens. For the hypersonic test cases, results are presented for two wires and for a composite wire-cylinder model. M.D.K.

N82-20483# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
CLASSIFIED LIST OF SUPPLEMENTARY ENTRIES
In its A Further Compilation of Compressible Boundary Layer Data With a Survey of Turbulence Data Nov. 1981 135 p refs (For primary document see N82-20478 11-34)
Avail: NTIS HC A10/MF A01

A compilation of data of turbulence measurements of a compressible boundary layer is presented. Measurements of the characteristics of the compressible turbulent boundary layer included data on: axially symmetric boundary layers, hot wire anemometry, shock-wave-induced pressure gradients, temperature measurements, cold-wall hypersonic turbulent layers, and other wind tunnel data. M.D.K.

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N82-20484 Illinois Univ. at Urbana-Champaign.
AN ON-LINE IMAGE PRE-PROCESSING CAMERA SYSTEM FOR PATTERN RECOGNITION Ph.D. Thesis
Randy Hays Moss 1981 89 p
Avail: Univ. Microfilms Order No. 8127652

A pattern recognition system was developed which is capable of recognizing high contrast two-dimensional visual patterns and is insensitive to the translation, rotation, and size of a pattern.

The system is intended primarily for industrial robotics applications. The camera system is used to input an image, to center it, to normalize it with respect to size, and to convert it into polar coordinate form. The input device is a standard closed circuit television camera. Rough centering is performed electromechanically and fine centering is done electronically. Size normalization is accomplished by utilizing a motorized zoom lens. Four experiments were performed to test the camera system. The results of these experiments are discussed and possible methods of increasing the speed of the system still further are suggested. Dissert. Abstr.

N82-20485*# American Science and Engineering, Inc., Cambridge, Mass.

STARPROBE: A DESIGN STUDY FOR AN X-RAY IMAGING INSTRUMENT

30 Oct. 1981 63 p refs Prepared for JPL
(Contracts NAS7-100; JPL-955928)
(NASA-CR-168669; NAS 1.26:168669; ASE-4672) Avail: NTIS HC A04/MF A01 CSCL 14B

The primary objective of the X-ray imaging telescope on STARPROBE is the acquisition of very high special resolution observations during the spacecraft's perihelion passage. Design parameters, telescope prefilters, and structural and thermal analyses of the equipment are described and discussed. It is believed that the spatial resolution of the information recorded by the baseline design would be at least a factor of 10 better than can be reasonably expected from Earth orbit. Thermal models used in the study are also discussed. M.D.K.

N82-20486*# National Aeronautics and Space Administration, Washington, D. C.

DEVELOPMENT OF AN INSTRUMENT FOR EVALUATION OF INTERFEROGRAMS

F. Becker, G. Meier, and H. Wegner Dec. 1981 57 p refs Transl. into ENGLISH of Rept. 110/1981 Max-Planck Inst. fuer Stroemungsforschung, Goettingen, West Germany, Jun. 1981 62 p Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76673; NAS 1.15:76673; Rept-110/1981) Avail: NTIS HC A04/MF A01 CSCL 14B

A system for the evaluation of interference patterns was evaluated. A picture analysis system based on a computer with a television digitizer was used for digitizing and processing interferograms. Author

N82-20487# Ballistic Research Labs., Aberdeen Proving Ground, Md.

RADIO FREQUENCY OSCILLATOR TECHNIQUE FOR MONITORING VELOCITY AND STRUCTURAL INTEGRITY OF PROJECTILES DURING THEIR EXIT FROM THE MUZZLE

Rurik K. Loder and Jimmy Q. Schmidt Apr. 1981 30 p refs
(DA Proj. 1L1-62618-AH-80)
(AD-A100725; ARBRL-MR-03100) Avail: NTIS HC A03/MF A01 CSCL 14/2

Experimental techniques which are available for determining projectile muzzle velocity are outlined. Radio frequency velocimeters developed and tested are described, and representative examples of data sets obtained for the 40 mm, 75 mm, and 105 mm gun systems are presented. The advantages of the radio frequency technique over conventional methods are discussed. The design of the double inductance coil and schematics of the differential sensor circuitry are included with block diagrams of the logic circuit for the signal processor. A.R.H.

N82-20488# Pennsylvania State Univ., University Park. Div. of Natural Sciences and Engineering.

PULSED HOLOGRAPHY OF RAPIDLY MOVING DUST PARTICLES Final Research Report, 1 Jun. 1980 - 30 Mar. 1981

Keith M. Hagenbush 31 May 1981 30 p refs
(Grant AF-AFOSR-0197-80; AF Proj. 2308)
(AD-A109085; AFOSR-81-0847TR) Avail: NTIS HC A03/MF A01 CSCL 14/5

Alumina particles ranging from minor dimension 25 microns to major dimension 185 microns were given 20-120 m/s velocities via a carrier gas through a 500 microns nozzle. Off-axis image plane holograms were constructed of the dust. Resolution to 6 to 10 microns was achieved and image subtraction via a Pockel's cell external to the laser cavity was employed to restore contrast loss in double exposures. Particle velocities were measured in double exposures. Author (GRA)

N82-20489# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.

RESEARCH ON SAW SENSOR BIAS STABILITY Annual Technical Report, 1 Oct. 1980 - 1 Oct. 1981

E. J. Staples and A. P. Andrews Oct. 1981 87 p refs
(Contract MDA903-81-C-0081; ARPA Order 4061)
(AD-A109738; MRDC41082.4AR) Avail: NTIS HC A05/MF A01 CSCL 09/5

The results of measurements of absolute and differential bias stability in surface acoustic wave (SAW) accelerometers is reported. The objective is to develop SAW accelerometers with improved bias stability characteristics for moderately accurate inertial navigation. A method of determining preaging and long term stability in large numbers of dual-resonator structures using only a single frequency standard as reference is discussed. The results of stability measurements were combined with a study of the surface chemistry of electroded SAW crystals. Chemisorption and electrode oxidation were found to increase instability in these crystals. Careful control of the composition of electrode materials was found necessary in order to obtain low aging SAW resonators. Preliminary studies of bias stability with respect to inertial navigation using SAW accelerometers indicates cumulative displacement errors less than 20 meters/hour can be achieved over time periods up to one hour. Applications for SAW accelerometers as tactical inertial sensors are discussed. GRA

N82-20490# Shaker Research Corp., Ballston Lake, N. Y.

AN INVESTIGATION OF SENSORS SUITABLE FOR MONITORING BLADE DEFLECTIONS FOR A VA1310 WIND TUNNEL COMPRESSOR Final Report, Aug. 1980 - Feb. 1981

Donald S. Wilson Wright-Patterson AFB, Ohio AFWAL Jul. 1981 39 p refs
(Contract F33615-79-C-3019; AF Proj. 2404)
(AD-A109489; SRC-81TR72; AFWAL-TR-81-3076) Avail: NTIS HC A03/MF A01 CSCL 14/2

This work is a continuation of a contract to identify and develop a cost effective, reliable procedure for determining potential compressor blade failure in time to prevent the actual failure. The first phase of the contract proposed a system that utilizes non-contacting blade tip monitoring probes, a microprocessor and a host computer while this second phase concentrated on probe evaluation. Both static and dynamic tests were conducted to determine probe sensitivity, diameter of resolution and rise time. Author (GRA)

N82-20491# Electronics Research Lab., Adelaide (Australia).

PROPOSED DIGITAL CARTRIDGE RECORDING SYSTEM FOR WRELADS

T. R. Adams and D. M. Phillips Aug. 1981 22 p
(AD-A109484; ERL-0210-TM) Avail: NTIS HC A02/MF A01 CSCL 09/2

The present data recording system in WRELADS II uses a hybrid tape recorder. Signal waveforms are recorded in analogue form while system parameters are recorded digitally. The hybrid recording system has several disadvantages that would be overcome by introducing a fully digital recording system. A proposal is described for developing a system to utilize two high-capacity digital cartridge recorders in conjunction with a microprocessor based cartridge controller. GRA

N82-20492# Argonne National Lab., Ill. Components Technology Div.

DEVELOPMENT AND TESTING OF HIGH-TEMPERATURE ACOUSTIC DOPPLER FLOWMETER

H. B. Karplus, A. C. Raptis, and D. R. Canfield (Pittsburgh and Midway Coal Mining Co.) Sep. 1981 35 p refs
(Contract W-31-109-eng-38)
(DE82-003013; ANL/FE-81-64) Avail: NTIS HC A03/MF A01

The development and testing of an acoustic Doppler flowmeter

are discussed. The characteristics of this flowmeter are: (1) standoffs to isolate the transducers from the hot pipes; and (2) an electronics system with servo-controlled adjustable filters that can process a Doppler-shift signal spectrum generated by laminar flow conditions. Flowmeters are adapted to high-temperature and high-viscosity laminar flow streams found in coal liquefaction plants. DOE

N82-20493# Bendix Corp., Kansas City, Mo.
USE OF LATIN SQUARE ANALYSIS OF VARIANCE TO IDENTIFY SOURCES OF ERROR IN CANTILEVER DESIGN COORDINATE MEASURING MACHINES Final Report
L. L. Jones Oct. 1981 75 p refs
(Contract DE-AC04-76DP-00613)
(DE82-002430; BDX-613-2679) Avail: NTIS HC A04/MF A01

Errors in the machine geometry of a coordinate measuring machine (CMM) can affect its measurement capability and result in product misclassification. These errors can be quickly identified by applying the analysis of variance (AOV) technique to data from a Latin square three-dimensional ball plate. Fifteen single sources of error in machine geometry for a cantilever design CMM are analyzed. The results of the analysis indicate that each error source has a unique pattern in deviation from nominal in the three axes and may be identified by the proper interpretation of the AOV. The methodology developed in this study has been applied to data from a cantilever design CMM. The analysis resulted in correct identification of error sources in the machine geometry. Rapid identification and correction of errors in machine geometry increases machine productivity. DOE

36 LASERS AND MASERS

Includes parametric amplifiers.

N82-20494*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROCEEDINGS OF THE THIRTEENTH ANNUAL PRECISE TIME AND TIME INTERVAL (PTTI) APPLICATIONS AND PLANNING MEETING
Schuyler C. Wardrip Mar. 1982 864 p refs Meeting held at Washington, D.C., 1-3 Dec. 1981; sponsored by the Naval Observatory, NASA, Goddard Space Flight Center, Naval Electronic Systems Command, NRL, Defense Communications Agency, Chief of Naval Operations, NBS, Army Electronics Technology and Devices Lab., RADC
(NASA-CP-2220; NAS 1.55:2220) Avail: NTIS HC A99/MF A01 CSCL 20E

Proceedings of an annual Precise Time and Time Interval (PTTI) Applications and Planning Meeting are summarized. A transparent view of the state-of-the-art, an opportunity to express needs, a view of important future trends, and a review of relevant past accomplishments were considered for PTTI managers, systems engineers, and program planner. Specific aims were: to provide PTTI users with new and useful applications, procedures, and techniques; to allow the PTTI researcher to better assess fruitful directions for research efforts. M.D.K.

N82-20495*# Automation Industries, Inc., Silver Spring, Md.
PRECISE TIME AND TIME INTERVAL USERS, REQUIREMENTS AND SPECIFICATIONS
James R. Bowser *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 27-42 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The functional areas of application of Precise Time and Time Interval (PTTI) were considered and expanded. A comprehensive overview of the PTTI requirements and applications would provide an opportunity for individuals working in a specific functional area. Mutual problems, requirements, applications or successes shared by those in other functional areas were studied. Based upon the results of a two year study a compendium of PTTI requirements, applications and the means of meeting the requirements among Department of Defense components, other government agencies and major commercial users was compiled and is presented. It was found that the planning process for PTTI support for new acquisitions or new programs was less than a well defined, coordinated process. The processes are described in general terms and a generic model for requirements determination and subsequent coordination which may enhance the planning process and introduce cost benefits to the program is also presented. M.D.K.

N82-20496*# Naval Observatory, Washington, D. C.
PRECISE TIME DISSEMINATION VIA PORTABLE ATOMIC CLOCKS
Kenneth Putkovich *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 87-120 refs (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The most precise operational method of time dissemination over long distances presently available to the Precise Time and Time Interval (PTTI) community of users is by means of portable atomic clocks. The Global Positioning System (GPS), the latest system showing promise of replacing portable clocks for global PTTI dissemination, was evaluated. Although GPS has the technical capability of providing superior world-wide dissemination, the question of present cost and future accessibility may require a continued reliance on portable clocks for a number of years. For these reasons a study of portable clock operations as they are carried out today was made. The portable clock system that was utilized by the U.S. Naval Observatory (NAVOBSY) in the global synchronization of clocks over the past 17 years is described and the concepts on which it is based are explained. Some of its capabilities and limitations are also discussed. M.D.K.

N82-20497*# Coast Guard, Washington, D.C.
LORAN-C, AN OVERVIEW
William J. Thrall *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 121-132 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

LORAN-C a highly accurate radio navigation positioning system which operates at an assigned frequency of 10 kHz, and provides phase-coded pulses to develop hyperbolic time-difference lines-of-position (LOP's) was evaluated. LORAN-C provides precise time and time interval to within plus or minus 5 microseconds of UTC. The steps taken to plan, install, operate, and maintain the LORAN-C system up to the year 2000 are discussed. Topics included in the discussion were: theory of operation, timing, chain lanning, group repetition interval, coding delay versus emission delay, chain calibration, chart verification, system accuracy, signal reliability, and future developments. M.D.K.

N82-20498*# Air Force Space Div., Los Angeles, Calif.
USING THE NAVSTAR GLOBAL POSITIONING SYSTEM AS A GLOBAL TIMING SYSTEM
Karl L. Kovach *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 133-166 refs (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The application of NAVSTAR GPS to the problems of PTTI dissemination is discussed. A short review of the GPS concept lead to a detailed description of the implementation of time transfer through NAVSTAR GPS. Time was followed from the U.S. Naval Observatory (USNO) through the ground control, satellite, and receiving segments of GPS to the user's clock system. The three options by which a user's system can receive from the GPS receivers, currently under development by the DOD, are defined in detail. The electrical/digital/mechanical interface parameters along with suggested methods for their use are outlined for each option. A detailed error model is also presented for the traceability of UTC (GPS) to UTC (USNO). Real time synchronization between stationary users on the time continent can be controlled to within a few nanoseconds, and absolute post processed time offset with UTC (USNO) measured within 25 nanoseconds or better. A discussion of some of the potential work around techniques and their applications are included. M.D.K.

N82-20499*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A HISTORY AND ANALYSIS OF HYDROGEN MASER RELIABILITY
J. B. Curtright *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 167-174 (For primary document see N82-20494 11-36)
(Contract NAS7-100)
Avail: NTIS HC A99/MF A01 CSCL 20E

Hydrogen masers an integral part of the Deep Space Network, provide extremely accurate navigation about the outer planets, as well as precise location of tracking stations. Reliability of equipment over extended periods of time was considered. The Deep Space Network has a number of hydrogen masers deployed and in the test cycle, which enabled an analysis of reliability of several generations and breeds of construction. A history and analysis of hydrogen maser reliability over a three-year period was compiled several types of masers. M.D.K.

N82-20500*# Offshore Navigation, Inc., Harrahan, La.
FIELD OPERATIONS WITH CESIUM CLOCKS IN HF NAVIGATION SYSTEMS
E. H. Christy and D. A. Clayton *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 175-186 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

Networks of HF phase comparison marine navigation stations employing cesium clocks are discussed. The largest permanent network is in the Gulf of Mexico where some fourteen base stations are continuously active and others are activated as needed. These HF phase comparison systems, which operate on a single transmission path, require a clock on the mobile unit as well. Inventory consists of upwards of 70 clocks from two different manufacturers. The maintenance of this network as an operating system requires a coordinated effort involving clock preparation, clock environment control, station performance monitoring and field service. N.W.

N82-20501*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
HIGH ACCURACY OMEGA TIMEKEEPING
Edward A. Imbier *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 187-198 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The Smithsonian Astrophysical Observatory (SAO) operates a worldwide satellite tracking network which uses a combination of OMEGA as a frequency reference, dual timing channels, and portable clock comparisons to maintain accurate epoch time. Propogational charts from the U.S. Coast Guard OMEGA monitor program minimize diurnal and seasonal effects. Daily phase value publications of the U.S. Naval Observatory provide corrections to the field collected timing data to produce an averaged time line comprised of straight line segments called a time history file (station clock minus UTC). Depending upon clock location, reduced time data accuracies of between two and eight microseconds are typical. N.W.

N82-20502*# Naval Observatory, Washington, D. C.
RELATIONSHIPS BETWEEN U.S. NAVAL OBSERVATORY, LORAN-C AND THE DEFENSE SATELLITE COMMUNICATION SYSTEM
Laura G. Charron *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 201-216 refs (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The methods used in forming time scales for distant sites monitoring LORAN-C are addressed. The time transfers obtained via the defense satellite communication system (DSCS) and the data provided by this system used to calibrate these remote time scales are emphasized. The errors involved are discussed. N.W.

N82-20503*# Naval Observatory, Washington, D. C.
LORAN-C PREDICTION PROBLEMS
Carl F. Lukac *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 217-227 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

Control of time and frequency at remote stations and the maintenance of a constant time scale for LORAN-C chains are problems of practical importance. The stability of stations monitoring a LORAN-C chain is analyzed, in particular, those stations monitoring the Northwest Pacific chain. Individual determinations of the quantity, U.S. Naval Observatory Master lock are compared with an averaged value and monitored data. N.W.

N82-20504*# Hulburt (E. O.) Center for Space Research, Washington, D.C.
COMPARISON OF VLBI, TV AND TRAVELING CLOCK TECHNIQUES FOR TIME TRANSFER
J. H. Spencer, E. B. Waltman, K. J. Johnston, N. J. Santini, W. J. Klepczynski, D. N. Matsakis, P. E. Angerhofer, and G. M. Kaplan *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 231-241 refs Prepared jointly with the Naval Observatory (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

A three part experiment was conducted to develop and compare time transfer techniques. The experiment consisted of (1) a very long baseline interferometer (VLBI), (2) a high precision portable clock time transfer system between the two sites, and (3) a television time transfer. A comparison of the VLBI and traveling clock shows each technique can perform satisfactorily at the five nsec level. There was a systematic offset of 59 nsec between the two methods, which we attributed to a difference in epochs between VLBI formatter and station clock. The VLBI method had an internal random error of one nsec at the three sigma level for a two day period. Thus, the Mark II system performed well, and VLBI shows promise of being an accurate method of time transfer. The TV system, which had technical problems during the experiment, transferred time with a random error of about 50 nsec. N.W.

N82-20505*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DEVELOPMENT OF OPTICAL FIBER FREQUENCY AND TIME DISTRIBUTION SYSTEMS
George Lutes *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 243-262 refs (For primary document see N82-20494 11-36)
(Contract NAS7-100)
Avail: NTIS HC A99/MF A01 CSCL 20E

The development of ultra stable optical fiber distribution systems for the dissemination of frequency and timing references is reported. The ultimate design goals for these systems are a frequency stability of 10 to the -17 power for tau > or = 100 sec and time stability of + or - 0.1 ns for 1 year and operation over distances > or = 30 km. A prototype system is reviewed and progress is discussed. N.W.

N82-20506*# Bendix Field Engineering Corp., Columbia, Md.
LOW NOISE BUFFER AMPLIFIERS AND BUFFERED PHASE COMPARATORS FOR PRECISE TIME AND FREQUENCY MEASUREMENT AND DISTRIBUTION
R. A. Eichinger, P. Dachel, W. H. Miller, and J. S. Ingold *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 263-280 refs (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

Extremely low noise, high performance, wideband buffer amplifiers and buffered phase comparators were developed. These buffer amplifiers are designed to distribute reference frequencies from 30 KHz to 45 MHz from a hydrogen maser without degrading the hydrogen maser's performance. The buffered phase comparators are designed to intercompare the phase of state of the art

hydrogen masers without adding any significant measurement system noise. These devices have a 27 femtosecond phase stability floor and are stable to better than one picosecond for long periods of time. Their temperature coefficient is less than one picosecond per degree C, and they have shown virtually no voltage coefficients. N.W.

N82-20507*# Institut de Recherche de l'Hydro-Quebec, Montreal.
TIME TRANSFER BY IRIG-B TIME CODE VIA DEDICATED TELEPHONE LINK
G. Missout, J. Beland, D. Label, G. Bedard, and P. Bussiere *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 281-297 refs (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

Measurements were made of the stability of time transfer by the IRIG-B code over a dedicated telephone link on a microwave system. The short and long term Allan Variance was measured on both types of microwave system, one of which is synchronized, the other having free local oscillators. The results promise a time transfer accuracy of 10 microns. The paper also describes a prototype slave clock designed to detect interference in the IRIG-B code to ensure local time is kept during such interference. N.W.

N82-20508*# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
VARIATIONS IN PROPAGATION DELAY TIMES FOR LINE TEN (TV) BASED TIME TRANSFERS
M. C. Chiu and B. W. Shaw *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 299-307 refs (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

Variation in the propagation delay for a 30 km TV (Line Ten) radio link was evaluated for a series of 30 independent measurements. Time marks from TV Channel 5 WTTG in Washington, D.C. were simultaneously measured at the Johns Hopkins University Applied Physics Laboratory and at the United States Naval Observatory against each stations' local cesium standard clocks. Differences in the stations' cesium clocks were determined by portable cesium clock transfers. Thirty independent timing determinations were made. The root mean square deviation in the propagation delay calculated from the timing determinations was 11 ns. The variations seen in the propagation delays are believed to be caused by environmental factors and by errors in the portable clock timing measurements. In correlating the propagation delay variations with local weather conditions, only a moderate dependence on air temperature and absolute humidity was found. R.J.F.

N82-20509*# Mitre Corp., Bedford, Mass.
THE ROLE OF PRECISE TIME IN IFF
W. M. Bridge *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 309-323 refs (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The application of precise time to the identification of friend or foe (IFF) problem is discussed. The simple concept of knowing when to expect each signal is exploited in a variety of ways to achieve an IFF system which is hard to detect, minimally exploitable and difficult to jam. Precise clocks are the backbone of the concept and the various candidates for this role are discussed. The compact rubidium-controlled oscillator is the only practical candidate. R.J.F.

N82-20510*# Naval Research Lab., Washington, D. C.
DIGITAL PROCESSING CLOCK
David H. Phillips *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 325-346 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The digital processing clock SG 1157/U is described. It is compatible with the PTTI world where it can be driven by an external cesium source. Built-in test equipment shows synchronization with cesium through 1 pulse per second. It is built to be expandable to accommodate future time-keeping needs of the Navy as well as any other time ordered functions. Examples of this expandibility are the inclusion of an unmodulated XR3 time code and the 2137 modulate time code (XR3 with 1 kHz carrier). R.J.F.

N82-20511*# National Service of Metrology, Delft (Netherlands).
TIME COMPARISON VIA OTS-2
G. deJong, R. Kaarls, D. Kirchner (Graz Univ.), and H. Ressler (Graz Univ.) *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 347-368 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The time comparisons carried out via OTS-2 between the Technical University Graz (Austria) and the Varr Swinden Laboratory Delft (Netherlands) are discussed. The method is based on the use of the synchronization pulse in the TV-frame of the daily evening broadcasting of a French TV-program to Northern Africa. Corrections, as a consequence of changes in the position of the satellite coordinates are applied weekly after reception of satellite coordinates. A description of the method is given as well as some of the particular techniques used in both the participating laboratories. Preliminary results are presented. R.J.F.

N82-20512*# Interstate Electronics Corp., Anaheim, Calif.
DESIGN APPROACH FOR A MICROPROCESSOR-BASED GPS TIME TRANSFER RECEIVER
P. C. Ould and R. J. VanWechel *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 373-386 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The design concept and characteristics of a self-contained microprocessor-based Global Positioning System time transfer receiver is described. A prototype of this unit is currently in the test phase. It employs two-bit digital baseband correlation rather than analog IF correlation of the signals with the reference code. The correlator, numerically controlled oscillators and code generator are implemented in a special-purpose digital signal processor. The time is recovered in the digital code tracking loop, and final corrections are applied in the control processor. Other features of this design are: (1) drift-free digital mechanization; (2) high reliability of digital circuits; (3) flexible control capability of the microprocessor; and (4) potential for a high degree of digital VLSI chip development leading to compact, low-cost units. B.W.

N82-20513*# Stanford Telecommunications, Inc., Sunnyvale, Calif.
TIME TRANSFER USING NAVSTAR GPS
A. J. VanDierendock, Q. D. Hua, J. R. McLean, and A. R. Denz *In* NASA. Goddard Space Flight Center Proc. of the Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 389-418 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

A time transfer unit (TTU) developed for the U.S. Naval Observatory (USNO) has consistently demonstrated the transfer of time with accuracies much better than 100 nanoseconds. A new time transfer system (TTS), the TTS 502 was developed. The TTS 502 is a relatively compact microprocessor-based system with a variety of options that meet each individual's requirements, and has the same performance as the USNO system. The time transfer performance of that USNO system and the details of the new system are presented. B.W.

N82-20514*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GLOBAL POSITIONING SYSTEM TIME TRANSFER RECEIVER (GPS/TTR) PROTOTYPE DESIGN AND INITIAL TEST EVALUATION
J. Oaks, A. Frank, S. Falvey, M. Lister, James Buisson, C. Wardrip, and H. Warren *In its* Proc. of the 13 Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 419-448 refs Prepared in cooperation with NRL, Washington,

D.C. and Bendix Field Engineering Corp., Columbia, Md. (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

Time transfer equipment and techniques used with the Navigation Technology Satellites were modified and extended for use with the Global Positioning System (GPS) satellites. A prototype receiver was built and field tested. The receiver uses the GPS L1 link at 1575 MHz with C/A code only to resolve a measured range to the satellite. A theoretical range is computed from the satellite ephemeris transmitted in the data message and the user's coordinates. Results of user offset from GPS time are obtained by differencing the measured and theoretical ranges and applying calibration corrections. Results of the first field test evaluation of the receiver are presented. B.W.

N82-20515*# Naval Research Lab., Washington, D. C.
LONG TERM FREQUENCY STABILITY ANALYSIS OF THE GPS NAVSTAR 6 CESIUM CLOCK
Thomas B. McCaskill, Sarah Stebbins, Clarence Carson, and James Buisson *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 451-466 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

Time domain measurements, taken between the NAVSTAR 6 Spacecraft Vehicle (SV) and the Vandenberg Global Positioning System (GPS) Monitor Site, by a pseudo random noise receiver, were collected over an extended period of time and analyzed to estimate the long term frequency stability of the NAVSTAR 6 onboard frequency standard, referenced to the Vandenberg MS frequency standard. The technique employed separates the clock offset from the composite signal by first applying corrections for equipment delays, ionospheric delay, tropospheric delay, Earth rotation and the relativistic effect. The data are edited and smoothed using the predicted SV ephemeris to calculate the geometric delay. Then all available passes from each of the four GPS monitor stations, are collected at 1-week intervals and used to calculate the NAVSTAR orbital elements. The procedure is then completed by subtracting the corrections and the geometric delay, using the final orbital elements, from the composite signal, thus leaving the clock offset and random error. M.G.

N82-20516*# Bendix Field Engineering Corp., Columbia, Md.
TIME CODE DISSEMINATION EXPERIMENT VIA THE SIRIO-1 VHF TRANSPONDER
E. Detoma, G. Gobbo (Telespazio S.p.A.), S. Leschiutta (Politecnico di Torino), and V. Pettiti (Instituto Electtrotechnico Nazionale) *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 469-488 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

An experiment to evaluate the possibility of disseminating a time code via the SIRIO-1 satellite, by using the onboard VHF repeater is described. The precision in the synchronization of remote clocks was expected to be of the order of 0.1 to 1 ms. The RF carrier was in the VHF band, so that low cost receivers could be used and then a broader class of users could be served. An already existing repeater, even if not designed specifically for communications could be utilized; the operation of this repeater was not intended to affect any other function of the spacecraft (both the SHF repeater and the VHF telemetry link were active during the time code dissemination via the VHF transponder). M.G.

N82-20517*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
INTERCONTINENTAL CLOCK SYNCHRONIZATION WITH THE BLOCK 1 VLBI SYSTEM
Michell G. Roth *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 489-500 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The Block 1 very long baseline interferometer (VLBI) operated by the Deep Space Network (DSN) to make weekly measurements of the relative epoch and rate offsets between the time standards in the global network of DSN stations is discussed. The precision of these measurements routinely achieves sub-microsecond levels for epoch offset and accuracies of better than one part in 10 to the 12th power for rate offset. The implementation of the phase calibrator system permits absolute measurement of epoch offset to better than 10 nanoseconds. With the near-real-time play-back and on-line storage of VLBI data, the Block 1 system typically produces clock parameters within 48 hours from the time of observation. M.G.

N82-20518*# Mitre Corp., Bedford, Mass.
CLOCKS FOR AIRBORNE SYSTEMS
Norman Houlding *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 505-524 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The potential performance of compact oscillators, needed for the development of accurate clocks for future airborne systems (such as Identification Friend or Foe schemes), is addressed. In particular, extensive testing of rubidium oscillators manufactured by Efratom is discussed. The results indicate that an accuracy of better than 10 microseconds should be achievable in tactical aircraft provided that appropriate measures are adopted to counter the many environmental factors. In a favorable environment a stability of better than 5 x 10 to the -13th power for one day is achievable with present commercial units, but improvements are required to suit operation in an aircraft. With further development of rubidium controlled clocks the ultimate limitation on time accuracy in aircraft will probably be associated with time dissemination, maintenance difficulties and doctrinal hurdles. M.G.

N82-20519*# National Bureau of Standards, Washington, D.C. Time and Frequency Div.
UNPRECENTED SYNTONIZATION AND SYNCRONIZATION ACCURACY VIA SIMULTANEOUS VIEWING WITH GPS RECEIVERS: CONSTRUCTION CHARACTERISTICS OF AN NBS/GPS RECEIVER
Dick D. Davis, Marc Weiss, Alvin Clements, and David W. Allan *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 527-544 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The National Bureau of Standards/Global Positioning System (NBS/GPS) receiver is discussed. It is designed around the concept of obtaining high accuracy, low cost time and frequency comparisons between remote frequency standards and clocks with the intent to aid international time and frequency coordination. Preliminary tests of this comparison technique between Boulder, CO and Washington, D.C indicate the ability to do accurate time transfer to better that 10 ns, and frequency measurements to better than 1 part in 10 to the 14th power. The hardware and software of the receiver is detailed. The receiver is fully automatic with a built-in 0.1 ns resolution time interval counter. A microprocessor does data processing. Satellite signal stabilities are routinely at the 5 ns level for 15 s averages, and the internal receiver stabilities are at the 1 ns level. M.G.

N82-20520*# British Columbia Univ., Vancouver. Dept. of Physics.
CRYOGENIC MASERS
A. J. Berlinsky and W. N. Hardy *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 547-559 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

Various factors affecting the frequency stability of hydrogen masers are described and related to maser design parameters. The long-term frequency stability of a hydrogen maser is limited by the mechanical stability of the cavity, and the magnitudes of the wall relaxation, spin exchange, and recombination rates which affect the Q of the line. Magnetic resonance studies of hydrogen atoms at temperatures below 1 K and in containers coated with liquid helium films demonstrated that cryogenic masers may allow substantial improvements in all of these parameters. In particular the thermal expansion coefficients of most materials are negligible at 1 K. Spin exchange broadening is three orders of magnitude

smaller at 1 K than at room temperature, and the recombination and wall relaxation rates are negligible at 0.52 K where the frequency shift due to the 4 He-coated walls of the container has a broad minimum as a function of temperature. Other advantages of the helium-cooled maser result from the high purity, homogeneity, and resilence of helium-film-coated walls and the natural compatibility of the apparatus with helium-cooled amplifiers. M.G.

N82-20521*# Hewlett-Packard Labs., Palo Alto, Calif.
A TRAPPED MERCURY 199 ION FREQUENCY STANDARD
Leonard S. Cutler, Robin P. Giffard, and Michael D. McGuire *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 563-578 (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

Mercury 199 ions confined in an RF quadrupole trap and optically pumped by mercury 202 ion resonance light are investigated as the basis for a high performance frequency standard with commercial possibilities. Results achieved and estimates of the potential performance of such a standard are given. B.W.

N82-20522*# National Bureau of Standards, Boulder, Colo.
PROSPECTS FOR STORED ION FREQUENCY STANDARDS
David J. Wineland *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 579-591 refs (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

Fundamental limitations of possible frequency standards based on stored ions are examined. Practical limitations are also addressed but without regard to size, power consumption, and cost. With these guidelines, one can anticipate that a stored ion frequency standard with accuracy and stability better than 10 to the -15th power is now possible. Author

N82-20523*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RECENT DEVELOPMENTS AND PROPOSED SCHEMES FOR TRAPPED ION FREQUENCY STANDARDS
Lute Maleki *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 593-603 refs (For primary document see N82-20494 11-36)
(Contract NAS7-100)
Avail: NTIS HC A99/MF A01 CSCL 20E

Ion traps are exciting candidates as future precision frequency sources. Recent developments demonstrate that mercury ion frequency standards are capable of a stability performance comparable to commercial cesium standards. There is, however, considerable room for improvement with regard to the signal to noise problem. The 40 GHz microwave frequency implies that a careful design should be implemented to ensure the elimination of the unwanted side bands in the microwave pump signal. A long life, high performance light source to be used in a trapped mercury ion microwave standard must be developed and the long term performance of a trapped mercury ion microwave standard must be investigated. While newly proposed two photon pumping schemes in conjuction with mercury ions promise exciting developments for both microwave and optical frequency standards, other ions that may be potential candidates should be evaluated for their usefulness. A.R.H.

N82-20524*# Edgerton, Germeshausen and Grier, Inc., Salem, Mass. Frequency and Time Dept.
A RUBIDIUM CLOCK FOR GPS
William J. Riley *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 609-630 Sponsored in part by AFSC and Rockwell International (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The design objectives and approach; the more important design features; the signal parameters and error budget; and early test results in the development of a second-source rubidium frequency standard for use in the GPS navigation satellites are discussed. Tests of a breadboard version of the RFS show that the measured time-domain stability is within the goal specification. The results are uncorrected for the contribution of the reference and are probably limited by the reference stability in the medium term region. the Rb reference is better in the medium term region, but the Cs reference is etter at 10,000 seconds and longer, probably because of the barometric sensitivity of the rubidium reference unit. A.R.H.

N82-20525*# Aerospace Corp., Los Angeles, Calif.
INVESTIGATIONS OF LASER PUMPED GAS CELL ATOMIC FREQUENCY STANDARD
Charles H. Volk, James C. Camparo, and R. P. Fueholz *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 631-640 refs (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The performance characteristics of a rubidium gas cell atomic frequency standard might be improved by replacing the standard rubidium discharge lamp with a single mode laser diode. Aspects of the laser pumped gas cell atomic clock studied include effects due to laser intensity, laser detuning, and the choice of the particular atomic absorption line. Results indicate that the performance of the gas cell clock may be improved by judicious choice of the operating parameters of the laser diode. The laser diode also proved to be a valuable tool in investigating the operation of the conventional gas cell clock. Results concerning linewidths, the light shift effect and the effect of isotopic spin exchange in the conventional gas cell clock are reported. A.R.H.

N82-20526*# Sigma Tau Standards Corp., Tuscaloosa, Ala.
MAGNETIC STATE SELECTION IN ATOMIC FREQUENCY AND TIME STANDARDS
Harry E. Peters *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 645-661 refs Sponsored in part by RADC, Hanscom AFB, Mass. (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

Atomic standards such as those based upon cesium and hydrogen rely upon magnetic state selection to obtain population inversion in the hyperfine transition levels. Use of new design approaches and improved magnetic materials has made it possible to fabricate improved state selectors of small size, and thus the efficiency of utilization of beam flux is greatly improved and the size and weight of the standard is reduced. The sensitivity to magnetic perturbations is also decreased, so that the accuracy and stability of the standard is improved. Several new state selector designs are illustrated and the application to standards utilizing different atomic species is analyzed. Author

N82-20527*# Laval Univ. (Quebec).
FREQUENCY STABILITY OF MASER OSCILLATORS OPERATED WITH CAVITY Q
Michel Tetu, Pierre Tremblay, Paul Lesage, Pierre Petit, and Claude Audoin *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 667-681 refs Prepared in cooperation with Paris-Sud Univ. (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The short term frequency stability of masers equipped with an external feedback loop to increase the cavity quality factor was studied. The frequency stability of a hydrogen and a rubidium maser were measured and compared with theoretical evaluation. It is shown that the frequency stability passes through an optimum when the cavity Q is varied. Long term fluctuations are discussed and the optimum mid term frequency stability achievably by small size active and passive H-masers is considered. A.R.H.

N82-20528*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
INTRODUCTION TO SOME FUNDAMENTAL CONCEPTS OF GENERAL RELATIVITY AND TO THEIR REQUIRED USE IN SOME MODERN TIMEKEEPING SYSTEMS
Carroll O. Alley *In* NASA. Goddard Space Flight Center Proc.

of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 687-724 refs (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

Einstein's theory of gravity as curved space-time is presented. Emphasis is on the physical concepts, using only elementary mathematics. For the slow motions and weak gravitational fields experienced on Earth, the main curvature is that of time, not space. Experiments demonstrating this property are reviewed. The fundamental effects of motion and gravitational potential on clocks in many practical situations are discussed. T.M.

N82-20529*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE ROLE OF THE DEEP SPACE NETWORK'S FREQUENCY AND TIMING SYSTEM IN THE DETECTION OF GRAVITATIONAL WAVES
John C. Mankins *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 729-750 refs (For primary document see N82-20494 11-36)
(Contract NAS7-100)
Avail: NTIS HC A99/MF A01 CSCL 20E

A review of the Deep Space Network's (DSN) use of precision Doppler-tracking of deep space vehicles is presented. The review emphasizes operational and configurational aspects and considers: the projected configuration of the DSN's frequency and timing system; the environment within the DSN provided by the precision atomic standards within the frequency and timing system--both current and projected; and the general requirements placed on the DSN and the frequency and timing system for both the baseline and the nominal gravitational wave experiments. A comment is made concerning the current probability that such an experiment will be carried out in the foreseeable future.
Author

N82-20530*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE IMPLICATIONS OF PRECISE TIMEKEEPING OF DOPPLER GRAVITATIONAL WAVE OBSERVATIONS
John D. Anderson, F. B. Estabrook, and J. W. Armstrong *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 757-766 refs (For primary document see N82-20494 11-36)
(Contract NAS7-100)
Avail: NTIS HC A99/MF A01 CSCL 20E

Gravitational radiation from galactic and extragalactic astrophysical sources will induce spatial strains in the solar system, strains which can be measured directly by the Doppler radio link to distant spacecraft. Current noise sources in Pioneer and Voyager Doppler data are delineated and a comparison is made with expected signal levels from gravitational wave sources. The main conclusion is that it is possible to detect gravitational radiation with current DSN hydrogen maser systems stable in fractional frequency + or - 2 x 10 to the minus 14th power over 1000 sec. In the future, however, a serious Doppler observational program in gravitational wave astronomy will require frequency systems stable to at least 10 to the minus 16th power, but at the same time the current single frequency S-band uplink transmission will have to be replaced by a dual frequency capability. T.M.

N82-20531*# Aerospace Corp., Los Angeles, Calif.
LAMP RELIABILITY STUDIES FOR IMPROVED SATELLITE RUBIDIUM FREQUENCY STANDARD
R. P. Frueholz, M. Wun-Fogle, H. U. Eckert, Charles H. Volk, and P. F. Jones *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 767-788 refs (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

In response to the premature failure of Rb lamps used in Rb atomic clocks onboard NAVSTAR GPS satellites experimental and theoretical investigations into their failure mechanism were initiated. The primary goal of these studies is the development of an accelerated life test for future GPS lamps. The primary failure mechanism was identified as consumption of the lamp's Rb charge via direct interaction between Rb and the lamp's glass surface. The most effective parameters to accelerate the interaction between the Rb and the glass are felt to be RF excitation power and lamp temperature. Differential scanning calorimetry is used to monitor the consumption of Rb within a lamp as a function of operation time. This technique yielded base line Rb consumption data for GPS lamps operating under normal conditions. T.M.

N82-20532*# Naval Research Lab., Washington, D. C.
MAGNETIC SHIELDING AND VACUUM TEST FOR PASSIVE HYDROGEN MASERS
D. U. Gubser, S. A. Wolf, A. B. Jacoby, and L. D. Jones *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 791-799 refs (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

Vibration tests on high permeability magnetic shields used in the SAO-NRL Advanced Development Model (ADM) hydrogen maser were made. Magnetic shielding factors were measured before and after vibration. Preliminary results indicate considerable (<25%) degradation. Test results on the NRL designed vacuum pumping station for the ADM hydrogen maser are also discussed. This system employs sintered zirconium carbon getter pumps to pump hydrogen plus small ion pumps to pump the inert gases. In situ activation tests and pumping characteristics indicate that the system can meet design specifications. Author

N82-20533*# Tokyo Inst. of Tech. (Japan). Research Lab. of Precision Machinery and Electronics.
COMPOSITE-TYPE Rb-87 OPTICAL-PUMPING LIGHT SOURCE FOR THE RUBIDIUM FREQUENCY STANDARD
Nobunori Oura, Naim Kuramochi, Shigeya Naritsuka, and Teruhiko Hayashi *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 803-815 refs Sponsored in part by Hoso-Bunka Foundation (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The light source is composed of a cylindrical Rb-87 lamp 10 mm diameter and a Rb-85 filter cell 3-7 mm long attached to the front flat face of the lamp. This composite type device is operated in an oven at about 100 C. Thus a light source for Rb-87 hyperfine optical pumping less than 4 cm long by 3 cm diameter was constructed. Author

N82-20534*# Indian Space Research Organization, Ahmedabad. Geodesy Div.
AN NNSS SATELLITE TIMING RECEIVER
C. L. Jain, K. Kumar, H. I. Andharia, Mohan Singh, V. DSouza, V. K. Goel, and A. K. Sisodia *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 817-830 refs (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

The U.S. Navy Navigation Satellite System, NNSS, offers a unique worldwide facility for precise time synchronization. Space Applications Centre (SAC) developed a simple timing receiver. Using this timing receiver first the internal time consistency of NNSS was studied and then its performance to synchronize time was compared with that of National Time Standard. The methodology of data analysis, results, and various sources of error which affect the time transfer accuracy were studied and described. The main source of error was found to be the receiver delay which varies with signal strength. It is possible to apply that this delay correction empirically provided signal strength is recorded. M.D.K.

N82-20535*# Naval Research Lab., Washington, D. C.
NO WARMUP CRYSTAL OSCILLATOR
David H. Phillips *In* NASA. Goddard Space Flight Center Proc. of the 13th Ann. Precise Time and Time Interval (PTTI) Appl. and Planning Meeting Mar. 1982 p 831-850 ref (For primary document see N82-20494 11-36)
Avail: NTIS HC A99/MF A01 CSCL 20E

During warmup, crystal oscillators often show a frequency offset as large as 1 part in 10 to the 5th power. If timing

information is transferred to the oscillator and then the oscillator is allowed to warmup, a timing error greater than 1 millisecond will occur. For many applications, it is unsuitable to wait for the oscillator to warmup. For medium accuracy timing requirements where overall accuracies in the order of 1 millisecond are required, a no warmup crystal concept was developed. The concept utilizes two crystal oscillator, used sequentially to avoid using a crystal oscillator for timing much higher frequency accuracy once warmed up. The accuracy achieved with practical TCXOs at initial start over a range of temperatures is discussed. A second design utilizing two oven controlled oscillators is also discussed. M.D.K.

N82-20536# New Hampshire Univ., Durham. Dept. of Physics.
ALKALINE EARTH-NOBLE GAS EXCIMERS Final Technical Report, 1 Mar. 1979 - 31 Aug. 1981
John J. Wright 31 Aug. 1981 13 p
(Contract F49620-79-C-0049; AF Proj. 2303)
(AD-A108506; AFOSR-81-0774TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

An investigation of the interaction between alkaline earth atoms in the triplet state and noble gas atoms was made. A major effort was devoted to producing large triplet state populations via laser excitation of the singlet state and collisional transfer to the triplet state. Cross sections for this process were measured using a new technique developed in this laboratory. These cross sections were much larger than expected. The results predicted a population inversion in strontium was possible and an attempt was made to produce a strontium laser. Because of low laser pump power, and inversion of only fifty percent was achieved. A technique was developed to do laser spectroscopy at low temperature in a sealed cell containing metal atom vapors and high pressure noble gases. The technique was tested by measuring, for the first time, the excited state potential of the sodium-helium excimer molecular. This difficult experiment was made possible by state-of-the art laser spectroscopy and the low temperature technique, which enhanced the excimer emission by orders of magnitude. GRA

N82-20537# California Univ., San Diego. Dept. of Chemistry.
MULTIPLE MODULATION FOR OPTICAL PUMP-PROBE SPECTROSCOPY
Philippe Bado, Scott B. Wilson, and Kent R. Wilson Dec. 1981 13 p refs Submitted for publication
(Contract N00014-78-C-0325)
(AD-A109591; TR-5) Avail: NTIS HC A02/MF A01 CSCL 09/3

A system was built largely from readily available amateur radio gear. The system described uses radio frequency and audio modulation of pump and probe light beams allowing the detection of very weak signals (rms noise approx. 3 times 10 to the minus 11th power w for a 10-second time constant even in the presence of a much larger (0.036 W) background of pump and probe light. M.D.K.

N82-20538# Defence Research Establishment Valcartier (Quebec). Centre de Recherches pour la Defense.
SPLIT-STEP FOURIER METHOD FOR LASER PULSE PROPAGATION IN PARTICULATE MEDIA
W. G. Tam Oct. 1981 28 p refs
(AD-A109505; DREV-4214/81) Avail: NTIS HC A03/MF A01 CSCL 20/6

A new method of obtaining the mutual coherence function of a laser pulse propagating in a particulate medium is described. The treatment, based on the technique of the split-step Fourier transform, enables us to avoid the uncontrolled approximations often used to solve the parabolic differential equation of the mutual coherence function. Simple numerical algorithms in the form of algebraic recurrence relations are derived for the study of the phenomenon of pulse broadening induced by multiple scattering. Author (GRA)

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N82-20539 British Library Lending Div., Boston Spa (England).
PERFORMANCE OF SPHERICAL SPIRAL GROOVE BEARINGS
Tsuneo Someya, Seisui Yamamoto, and Kansho Fukuyama 3 Sep. 1981 19 p refs Transl. into ENGLISH from the Trans. of the Japanese Soc. of Mech. Engr. (Japan), v. 45, no. 391, Mar. 1979 p 370-391 Presented at the 50th Anniv. Congr. of the Japanese Soc. of Mech. Engr., Tokyo, 10 Oct. 1977
(BLL-WH-483-(9091.9F)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The performance of spherical spiral groove bearings (SSGB), is studied. In a shafting using SSGB, elasticity modulus and damping coefficient of the oil film present problems where eccentricities (epsilon sub z, epsilon sub x) of SSGB change. Assuming that an SSGB has a finite number of grooves, the effects of axial and radial eccentricities on elasticity modulus and damping coefficient of the oil film on the dynamic behavior of SSGB were analyzed by the finite element method. In addition, the behavior of SSGB not having normal spiral grooves (referred to as deformed groove SSGB) was analyzed. S.L.

N82-20540*# SKF Technology Services, King of Prussia, Pa. Technology Services.
SPHERICAL ROLLER BEARING ANALYSIS. SKF COMPUTER PROGRAM SPHERBEAN. VOLUME 1: ANALYSIS Final Report, Jun. 1978 - Dec. 1980
R. J. Kleckner and J. Pirvics Dec. 1980 86 p refs 3 Vol.
(Contract NAS3-20824)
(NASA-CR-165203; NAS 1.26:165203; AT81D006-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 13I

The models and associated mathematics used within the SPHERBEAN computer program for prediction of the thermomechanical performance characteristics of high speed lubricated double row spherical roller bearings are presented. The analysis allows six degrees of freedom for each roller and three for each half of an optionally split cage. Roller skew, free lubricant, inertial loads, appropriate elastic and friction forces, and flexible outer ring are considered. Roller quasidynamic equilibrium is calculated for a bearing with up to 30 rollers per row, and distinct roller and flange geometries are specifiable. The user is referred to the material contained here for formulation assumptions and algorithm detail. J.D.H.

N82-20541*# SKF Technology Services, King of Prussia, Pa. Technology Services.
SPHERICAL ROLLER BEARING ANALYSIS. SKF COMPUTER PROGRAM SPHERBEAN. VOLUME 2: USER'S MANUAL Final Report, Jun. 1978 - Dec. 1980
R. J. Kleckner and G. Dyba Dec. 1980 150 p refs 3 Vol.
(Contract NAS3-20824)
(NASA-CR-165204; NAS 1.26:165204; AT81D007-Vol-2) Avail: NTIS HC A07/MF A01 CSCL 13I

The user's guide for the SPHERBEAN computer program for prediction of the thermomechanical performance characteristics of high speed lubricated double row spherical roller bearings is presented. The material presented is structured to guide the user in the practical and correct implementation of SPHERBEAN. Input and output, guidelines for program use, and sample executions are detailed. J.D.H.

N82-20542*# SKF Technology Services, King of Prussia, Pa. Technology Services.
SPHERICAL ROLLER BEARING ANALYSIS. SKF COMPUTER PROGRAM SPHERBEAN. VOLUME 3: PROGRAM CORRELATION WITH FULL SCALE HARDWARE TESTS Final Report, Jun. 1978 - Dec. 1980
R. J. Kleckner, J. W. Rosenlieb, and G. Dyba Dec. 1980 225 p refs 3 Vol.
(Contract NAS3-20824)
(NASA-CR-165205; NAS 1.26:165205; AT81D008-Vol-3) Avail: NTIS HC A10/MF A01 CSCL 13I

The results of a series of full scale hardware tests compar-

ing predictions of the SPHERBEAN computer program with measured data are presented. The SPHERBEAN program predicts the thermomechanical performance characteristics of high speed lubricated double row spherical roller bearings. The degree of correlation between performance predicted by SPHERBEAN and measured data is demonstrated. Experimental and calculated performance data is compared over a range in speed up to 19,400 rpm (0.8 MDN) under pure radial, pure axial, and combined loads. J.D.H.

N82-20543*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

HIGH-SPEED MOTION PICTURE CAMERA EXPERIMENTS OF CAVITATION IN DYNAMICALLY LOADED JOURNAL BEARINGS

Bo O. Jacobson and Bernard J. Hamrock 1982 22 p refs Proposed for presentation at the Joint Lubrication Conf., Washington, D.C., 5-7 Oct. 1982; sponsored by ASME and American Society of Lubrication Engineers

(NASA-TM-82798; E-1137; NAS 1.15:82798) Avail: NTIS HC A02/MF A01 CSCL 13I

A high-speed camera was used to investigate cavitation in dynamically loaded journal bearings. The length-diameter ratio of the bearing, the speeds of the shaft and bearing, the surface material of the shaft, and the static and dynamic eccentricity of the bearing were varied. The results reveal not only the appearance of gas cavitation, but also the development of previously unsuspected vapor cavitation. It was found that gas cavitation increases with time until, after many hundreds of pressure cycles, there is a constant amount of gas kept in the cavitation zone of the bearing. The gas can have pressures of many times the atmospheric pressure. Vapor cavitation bubbles, on the other hand, collapse at pressures lower than the atmospheric pressure and cannot be transported through a high-pressure zone, nor does the amount of vapor cavitation in a bearing increase with time. Analysis is given to support the experimental findings for both gas and vapor cavitation. J.D.H.

N82-20544*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

VARIABLE RESPONSE LOAD LIMITING DEVICE Patent Application

Dwight D. McSmith, inventor (to NASA) Filed 6 Oct. 1981 18 p

(NASA-Case-LAR-12801-1; US-Patent-Appl-SN-309291) Avail: NTIS HC A02/MF A01 CSCL 13I

An energy absorbing device used as a load limiting member in a structure to control its response to applied loads is described. It functions by utilizing a spool assembly having flanged ends and an interior cavity of sufficiently large diameter to cause it to deform plastically at a prescribed load. In application, the spool is utilized as a pivot point for the legs of an aircraft seat. When properly designed and integrated into the seat arrangement the spool will twist about its axis, deforming plastically when the impact load exceeds the spool yield value. Through this deformation, the spool absorbs the kinetic energy of the movement of the seat at a substantially constant rate, thereby controlling the level of loads transmitted to the seat occupant. By proper sizing and selection of materials, it is possible to control load response in a predictable manner. NASA

N82-20545*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

TUBING AND CABLE CUTTING TOOL Patent Application

Dwight D. McSmith and James I. Richardson, inventors (to NASA) Filed 6 Oct. 1981 10 p

(NASA-Case-LAR-12786-1; US-Patent-Appl-SN-309292) Avail: NTIS HC A02/MF A01 CSCL 13I

A hand held hydraulic cutting tool was developed which is particularly useful in deactivating ejection seats in military aircraft rescue operations. The tool consists primarily of a hydraulic system composed of a fluid reservoir, a pumping piston, and an actuator piston. Mechanical cutting jaws are attached to the actuator piston rod. The hydraulic system is controlled by a pump handle. As the pump handle is operated the actuator piston rod is forced outward and thus the cutting jaws are forced together. The frame of the device is a flexible metal tubing which permits easy positioning of the tool cutting jaws in remote and normally inaccessible locations. Bifurcated cutting edges ensure removal of a section of the tubing or cable to thereby reduce the possibility of accidental reactivation of the tubing or cable being severed. NASA

N82-20546# Naval Academy, Annapolis, Md. Aerospace Engineering Dept.

OPTIMIZING THE NAHBE PISTON CAP DESIGN UTILIZING SCHLIEREN PHOTOGRAPHY METHODS AND APPLICATIONS OF THE HELMHOLTZ RESONATOR THEORY Final Report, 1980 - 1981

William H. Johnson 2 Jun. 1981 98 p refs

(AD-A109656; USNA-TSPR-112) Avail: NTIS HC A05/MF A01 CSCL 20/13

The Naval Academy Heat Balanced Engine (NAHBE) was studied extensively for the last five years. Efforts to understand and predict the process occurring in the engine were complicated and difficult to verify experimentally. Optimization of the output of the engine, though possible, took much too long a time through parametric variation. An answer to the problem of predicting the time dependent reaction occurring in the engine was sought. Also, some easy design tool for optimizing the reaction was required. One possible solution to these problems was to model the NAHBE piston cap through the Helmholtz Resonator Theory. This theory generalized the time dependent reaction of a volume of fluid in a chamber by the acoustic analog to the mechanical system forced oscillator. The theory enables one to predict or design the acoustic impedance of a cavity and its natural frequency by way of the cavity and inlet geometry. This study shows how the solution to the Helmholtz theory may be obtained and the fluid mass displacement of NAHBE cap modeled by the Helmholtz theory predicted. GRA

N82-20547# Army Materials and Mechanics Research Center, Watertown, Mass. Materials Testing Technology Div.

TIRE TESTING SYMPOSIA: A SUMMARY Final Report

Charles P. Merhib Dec. 1981 14 p

(AD-A109692; AMMRC-MS-81-1) Avail: NTIS HC A02/MF A01 CSCL 13/6

Four symposia on nondestructive testing of tires were held from April 1973 to May 1978. Sponsored by AMMRC, these symposia gathered together NDT tire experts from the United States and foreign countries to present the results of their work, exchange ideas, and provide a forum for discussion of problems common to government and industry. Working panels on various NDT methods were conducted during these symposia. Proceedings of the four symposia, including panel summaries, have been published. This report summarizes and offers comments on the overall findings of the working panels. GRA

N82-20548# Army Construction Engineering Research Lab., Champaign, Ill.

IDENTIFICATION OF PROBLEMS ENCOUNTERED IN THE FIELD WELDING OF ALUMINUM Final Report

R. A. Weber Oct. 1981 37 p refs

(AD-A109697; CERL-TR-M-301) Avail: NTIS HC A03/MF A01 CSCL 11/6

This report identifies the procedures and equipment used for field welding of aluminum, determines the most common types of failures encountered, determines problems with field welding maintenance, and proposes solutions to these problems. It has been found that the most common damages to aluminum structures are puncturing and tearing. These damages must be repaired in the field in order to keep equipment at a high degree of operational readiness. The repair of such damages requires maintenance personnel skilled in aluminum welding. The results of this investigation show that current training procedures do not produce maintenance personnel with adequate aluminum welding skills. In addition, there is a lack of skilled supervisors who can provide adequate on-the-job training to new maintenace personnel. The standardized welding procedure proposed by this investigation will help resolve these problems. Author (GRA)

N82-20549# Pace Associates, Inc., Milwaukee, Wis.

HEAVY-DUTY ENGINES ANALYSIS, STUDY 4: A PRELIMINARY MARKET ANALYSIS FOR GAS-TURBINE APPLICATIONS IN THE FARM MARKET

Jul. 1981 18 p refs Prepared for Argonne National Lab.

(Contract W-31-109-eng-38)
(DE82-001758; ANL/CNSV-TM-81) Avail: NTIS HC A02/MF A01

The opportunity for the gas turbine in the farm market and if the market's requirements complement the development of the engine for other markets was analyzed. It was determined that the major applications of gas turbines in the farm equipment market are in two wheel drive and four wheel drive diesel powered tractors. However, the market for gas turbines lies at the heavier end of the spectrum. There is an opportunity for larger quantities of lower horsepower engines because turbine engines for automobiles would be in the same size range. It is suggested that the development of a reliable multifuel turbine combined with a reliable power train capable of meeting the load requirements of the farm tractor is a timely undertaking. Fuel efficiency requirements are balanced by the need for multifuel capability and imposed environmental requirements. DOE

N82-20550 Columbia Univ., New York.
MINIMIZATION OF INERTIA-INDUCED FORCES IN STATICALLY INDETERMINATE SPATIAL LINKAGES Ph.D. Thesis
Gurdev Singh Gill 1981 223 p
Avail: Univ. Microfilms Order No. 8125289

Computer-aided design procedures were developed for minimizing the adverse effects of the inertia induced forces by optimum mass redistribution of the links of high speed spherical four bar linkages and wobble plate engines. The evaluation of an optimality criterion for the mass redistribution of the mechanism was carried out with the aid of a quadratic programming technique. This was successful in minimizing the inertia induced forces and torques. The validity of the optimization procedure was demonstrated by its application to a Hooke type universal joint, a spherical wobble plate drive, an ideal wobble plate engine and a spherical wobble plate engine. Dissert. Abstr.

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N82-20551*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
INTERRELATION OF MATERIAL MICROSTRUCTURE, ULTRASONIC FACTORS, AND FRACTURE TOUGHNESS OF TWO PHASE TITANIUM ALLOY
Alex Vary and David R. Hull 1982 25 p refs Presented at the Spring Conf. of the Am. Soc. for Nondestructive Testing, Boston, 22-25 Mar. 1982
(NASA-TM-82810; E-1151; NAS 1.15:82810) Avail: NTIS HC A02/MF A01 CSCL 14D

The pivotal role of an alpha-beta phase microstructure in governing fracture toughness in a titanium alloy, Ti-662, is demonstrated. The interrelation of microstructure and fracture toughness is demonstrated using ultrasonic measurement techniques originally developed for nondestructive evaluation and material property characterization. It is shown that the findings determined from ultrasonic measurements agree with conclusions based on metallurgical, metallographic, and fractographic observations concerning the importance of alpha-beta morphology in controlling fracture toughness in two phase titanium alloys. Author

N82-20552# Pittsburg Univ., Pa. Inst. for Statistics and Applications.
ON THE AXIOMATIC THEORY OF MULTISTATE COHERENT STRUCTURES
Wagner deSouzaBorges and Flavio Wagner Rodrigues Oct. 1981 17 p refs
(Contract N00014-75-C-0839)
(AD-A109732; TR-81-1) Avail: NTIS HC A02/MF A01 CSCL 12/1

Mathematical models for multistate reliability systems of multistate components have been proposed by Barlow and Wu (1978), El Neweihi et al (1978) and Griffiths (1981). Unlike the approach used by Barlow and Wu, the other authors preferred to establish their classes of models through sets of axioms, all extending the early binary notions and all containing as special cases the class of models suggested by Barlow and Wu. Since the Barlow and Wu approach is essentially set theoretic, and since in the other two approaches these models were not characterized among the larger classes, one question that arises is whether these models can be characterized by a set of axioms in the same way as their counterparts. In this paper we do just that and obtain a better understanding of Barlow and Wu models. Author (GRA)

N82-20553# Stanford Univ., Calif.
ON OPTIMUM INSPECTION SCHEDULES
S. Patrick Koh Nov. 1981 43 p refs
(Contract N00014-75-C-0561)
(AD-A109810; SU-TR-201) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper treats the problem of determining the minimax inspection schedule for detecting failure of a component or system when inspections have a cost and cost of failure is proportional to the length of time between failure and detection. The minimaxing is done with respect to all failure distributions having a given mean. Author (GRA)

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N82-20554 Kansas Univ., Lawrence.
COMPOSITE BEAMS WITH WEB OPENINGS Ph.D. Thesis
William Charles Clawson 1981 222 p
Avail: Univ. Microfilms Order No. 8128753

Six composite beams with concentric rectangular web openings were tested to help develop and verify the ultimate strength model. One steel beam was tested to demonstrate the contribution of the concrete to the capacity in composite beams. Two steel sections were used, while the concrete slab size was held constant for all beams. Three elastic tests were performed on each beam before it was tested to failure. The ultimate strength model was developed to predict the strength of composite beams at the web openings with varying amounts of moment and shear in the form of moment-shear interactions diagrams. It is clear that web openings can greatly reduce the strength of composite beams. It appears that the secondary bending has a sizable effect on beam behavior. The concrete in composite beams contributes, not only, to the flexural strength, but, also, to the shear capacity of the beams at web openings. The ultimate strength of composite beams at web openings is governed by the failure of the concrete. Dissert. Abstr.

N82-20555 West Virginia Univ., Morgantown.
ANALYSIS OF STIFFENED PLATE STRUCTURES OF VARIOUS SHAPES AND BOUNDARIES Ph.D. Thesis
Hany Jamil Farran 1981 411 p
Avail: Univ. Microfilms Order No. 8127817

The main research effort centers on the solution of the biharmonic equation which is a boundary value problem of mathematical physics. Plates stiffened as well as unstiffened are treated with a generalized form for the loading and the different boundary conditions. The purpose is to solve the biharmonic plate equation for different plate shape and the various stiffening schemes utilizing finite and infinite series. The solutions obtained shall be compared to solutions that are tractable by the finite element technique, as well as other numerical and classical approaches. The practical utilization of the findings will be documented to present practicing engineers with an elegant formulation for a particular plate problem irrespective of the imposed loading, shape, or boundary conditions. As contrasted to the numerical finite element technique and the standard matrix approaches, this method will give solutions at nodal points as

well as any ponts within the structural continuum. It is hoped that the final outcome of this dissertation will present a series-functional solution (finite and infinite) to various plate problems in such a way that solution of large numbers of equations is bypassed and only a few terms of the onverging series solution are taken to arrive at acceptable results. Dissert. Abstr.

N82-20556 Kansas State Univ., Manhattan.
FINITE ELEMENT AND EXPERIMENTAL STUDIES OF STRESS-INTENSITY FACTORS FOR CONCRETE BEAMS Ph.D. Thesis
Chen-Ming James Huang 1981 150 p
Avail: Univ. Microfilms Order No. 8127876

The finite element method utilizing a singular element around the crack tip and regular elements in the region away from the tip was developed to model a structural component with a single edge crack subjected load. Generalized parameters including displacements and their derivatives were used as unknowns at each nodal point. Results indicated that the total number of unknowns needed for a given level of accuracy was reduced as compared to that used in ordinary finite element analysis. Plain concrete beams were notched and then precracked by static or fatigue loading prior to loading to failure. The effects of three-point and four-point bending, two sizes of beams and two different mix designs were investigated. Test results showed that the fracture toughness of statically-precracked beams is higher than that of fatigue precracked beams and fracture toughness of concrete is associated with its strength in compression. It is further noted that results obtained for the specimens in four-point bending are more consistent than those for three-point bending. Dissert. Abstr.

N82-20557 West Virginia Univ., Morgantown.
PLATE BENDING ANALYSIS BY MACRO FLEXIBILITY APPROACH Ph.D. Thesis
Thomas Jack Parsons 1981 122 p
Avail: Univ. Microfilms Order No. 8127828

A macroflexibility approach for determining deflections and forces in plate bending problems is developed. Macroelements of rectangular and triangular shapes were obtained by representing the deflected shaped by a shape function that satisfies the boundary conditions and the biharmonic equation. The shape functions are a linear sum of sinusoidal and polynomial terms with undetermined coefficients. By substitution into the biharmonic equation and boundary conditions the coefficients are determined. The substitution results in a set of simultaneous summation equations, which are solved by standard matrix techniques. The elements are assembled by utilizing the compatibility equations for deflection and slope, and the equilibrium of forces and moments is satisfied for all points along the common edges. Six bounded domains of arbitrary shape were analyzed, and the results were compared to solutions obtained from the classical methods, finite element method, and Chaudhary's triangular element functions. Dissert. Abstr.

N82-20558 Iowa State Univ. of Science and Technology, Ames.
TRANSIENT THERMAL STRESSES AT NEAR SURFACE ELLIPTICAL HOLES Ph.D. Thesis
Ibrahim Miskioglu 1981 160 p
Avail: Univ. Microfilms Order No. 8128842

The influence of the near surface elliptical holes on the stress field when the surface experiences a rapid temperature change is determined. The problem is formulated as a two dimensional transient problem in a multiply connected semi-infinite region. It is assumed that the quasistatic formulation of thermoelasticity is valid. The experimental technique used was photothermoelasticity by means of heating. The transient thermal stress concentration factors around the elliptical boundary are obtained, and the variation of the stress concentration factor with the geometrical parameters (major and minor axes) and the angular orientation (measured as the angle between the major axis and straight boundary) of the ellipse are investigated. Four different ellipse sizes, with the ratio of the minor to major axis b/a = 0.50, 0.40, 0.33 and 0.30 and five different angular orientations, theta = 0, 22.5, 45, 75, and 90 deg, are used. Dissert. Abstr.

N82-20559 Illinois Univ. at Urbana-Champaign.
ON THE THEORY OF STRESS-ASSISTED DIFFUSION Ph.D. Thesis
David James Unger 1981 68 p
Avail: Univ. Microfilms Order No. 8127721

Similarity and general steady state solutions of a stress assisted diffusion theory are obtained. General transient solutions are obtained analytically for certain classes of stress distributions. For general stress distributions a perturbation method is employed to produce transient solutions. Under appropriate circumstances the derived solutions are reduced to formulae that have been proposed. Examples of interesting crack problems involving stress singularities as well as the elimination of singularities are considered. An equilibrium solution is utilized together with a straightforward physical argument to produce rationally two empirical formulae to model embrittlement and stress corrosion cracking phenomena. This solution is further utilized to model embrittlement and stress corrosion cracking data successfully. An appendix on certain preliminary elastodiffusive fracture criteria is given. Dissert. Abstr.

N82-20560 California Univ., Berkeley.
A LAYERING APPROACH TO SYSTEM IDENTIFICATION: APPLICATION TO DYNAMICS OF LINEAR STRUCTURES WITH MEASURED EIGENPROPERTIES Ph.D. Thesis
Andrew Kai-On Chou 1981 244 p
Avail: Univ. Microfilms Order No. 8200056

A general view of system identification in relation to structures is presented. The distinctive characteristics of structural systems are discussed. The Group Method of Data Handling (GMDH) in polynomial regression is then described and illustrated in terms of its adaptation to the proposed algorithm. The GMDH derives from a nonuniqueness concept of solution to engineering problems. At every layer of the solution process, a subset of solutions is produced, from which elements are selected for advancement to a higher layer. Extensive numerical experimentation is carried out based on unbiased analytical models with randomness in initial estimates of parameters, selection of parameter combinations, and measurement errors. The results of the numerical experimentation indicate that: (1) the algorithm is inherently stable; (2) variation in random selection of parameter combinations affects the convergence rate but not the converged results; (3) best convergence is achieved by partitioning the parameters into two groups in the 1st layer and encompassing the complete set in the 2nd layer; and (4) with uncorrupted data, all the parameters converge with zero error. Dissert. Abstr.

N82-20561*# California Univ., Los Angeles.
APPLICATION OF THE FINITE ELEMENT METHOD TO ROTARY WING AEROELASTICITY Final Report
F. K. Straub and P. P. Friedmann Feb. 1982 232 p refs
(Grant NsG-1578)
(NASA-CR-165854; NAS 1.26:165854; UCLA-ENG-80-81)
Avail: NTIS HC A11/MF A01 CSCL 20K

A finite element method for the spatial discretization of the dynamic equations of equilibrium governing rotary-wing aeroelastic problems is presented. Formulation of the finite element equations is based on weighted Galerkin residuals. This Galerkin finite element method reduces algebraic manipulative labor significantly, when compared to the application of the global Galerkin method in similar problems. The coupled flap-lag aeroelastic stability boundaries of hingeless helicopter rotor blades in hover are calculated. The linearized dynamic equations are reduced to the standard eigenvalue problem from which the aeroelastic stability boundaries are obtained. The convergence properties of the Galerkin finite element method are studied numerically by refining the discretization process. Results indicate that four or five elements suffice to capture the dynamics of the blade with the same accuracy as the global Galerkin method. A.R.H.

N82-20562*# Boeing Aerospace Co., Kent, Wash.
DESIGN AND FABRICATION OF BRAZED RENE 41 HONEYCOMB SANDWICH STRUCTURAL PANELS FOR ADVANCED SPACE TRANSPORTATION SYSTEMS Final Report, Mar. 1978 - Aug. 1980
Andrew K. Hepler and Allan R. Swegle Dec. 1981 49 p refs
(Contract NAS1-14213)
(NASA-CR-165801; NAS 1.26:165801; D180-26252-1) Avail:

NTIS HC A03/MF A01 CSCL 20K

The design and fabrication of two large brazed Rene 41 honeycomb panels, the establishment of a test plan, the design and fabrication of a test fixture to subject the panels to cyclic thermal gradients and mechanical loads equivalent to those imposed on an advanced space transportation vehicle during its boost and entry trajectories are discussed. The panels will be supported at four points, creating three spans. The outer spans are 45.7 cm (18 in.) and the center span 76.2 cm (30 in). Specimen width is 30.5 cm (12 in.). The panels were primarily designed by boost conditions simulated by subjecting the panels to liquid nitrogen, 77K (-320 F) on one side and 455K (360 F) on the other side and by mechanically imposing loads representing vehicle fuel pressure loads. Entry conditions were simulated by radiant heating to 1034K (1400 F). The test program subjected the panels to 500 boost thermal conditions. Results are presented. M.D.K.

N82-20563*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

PASCO: STRUCTURAL PANEL ANALYSIS AND SIZING CODE: USERS MANUAL - REVISED

Melvin S. Anderson, W. Jefferson Stroud, Barbara J. Durling, and Katherine W. Hennessy Nov. 1981 110 p refs

(NASA-TM-80181-Rev; NAS 1.15:80182) Avail: NTIS HC A06/MF A01 CSCL 20K

A computer code denoted PASCO is described for analyzing and sizing uniaxially stiffened composite panels. Buckling and vibration analyses are carried out with a linked plate analysis computer code denoted VIPASA, which is included in PASCO. Sizing is based on nonlinear mathematical programming techniques and employs a computer code denoted CONMIN, also included in PASCO. Design requirements considered are initial buckling, material strength, stiffness and vibration frequency. A user's manual for PASCO is presented. R.J.F.

N82-20564*# Case Western Reserve Univ., Cleveland, Ohio.

FATIGUE LIFE PREDICTION IN BENDING FROM AXIAL FATIGUE INFORMATION

S. S. Manson and U. Muralidharan Feb. 1982 38 p refs (Grant NAG3-39)

(NASA-CR-165563; NAS 1.26:165563) Avail: NTIS HC A03/MF A01 CSCL 20K

Bending fatigue in the low cyclic life range differs from axial fatigue due to the plastic flow which alters the linear stress-strain relation normally used to determine the nominal stresses. An approach is presented to take into account the plastic flow in calculating nominal bending stress (S sub bending) based on true surface stress. These functions are derived in closed form for rectangular and circular cross sections. The nominal bending stress and the axial fatigue stress are plotted as a function of life (N sub S) and these curves are shown for several materials of engineering interest. S.L.

N82-20565*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ELASTIC-PLASTIC FINITE-ELEMENT ANALYSES OF THERMALLY CYCLED SINGLE-EDGE WEDGE SPECIMENS

Albert Kaufman Mar. 1982 27 p refs

(NASA-TP-1982; E-687; NAS 1.60:1982) Avail: NTIS HC A03/MF A01 CSCL 20K

Elastic-plastic stress-strain analyses were performed for single-edge wedge alloys subjected to thermal cycling in fluidized beds. Three cases (NASA TAZ-8A alloy under one cycling condition and 316 stainless steel alloy under two cycling conditions) were analyzed by using the MARC nonlinear, finite-element computer program. Elastic solutions from MARC showed good agreement with previously reported solutions that used the NASTRAN and ISO3DQ computer programs. The NASA TAZ-8A case exhibited no plastic strains, and the elastic and elastic-plastic analyses gave identical results. Elastic-plastic analyses of the 316 stainless steel alloy showed plastic strain reversal with a shift of the mean stresses in the compressive direction. The maximum equivalent total strain ranges for these cases were 13 to 22 percent greater than that calculated from elastic analyses. Author

N82-20566*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

ELASTIC-PLASTIC FINITE-ELEMENT ANALYSES OF THERMALLY CYCLED DOUBLE-EDGE WEDGE SPECIMENS

Albert Kaufman and Larry E. Hunt Mar. 1982 31 p refs

(NASA-TP-1973; E-626; NAS 1.60:1973) Avail: NTIS HC A03/MF A01 CSCL 20K

Elastic-plastic stress-strain analyses were performed for double-edge wedge specimens subjected to thermal cycling in fluidized beds at 316 and 1088 C. Four cases involving different nickel-base alloys (IN 100, Mar M-200, NASA TAZ-8A, and Rene 80) were analyzed by using the MARC nonlinear, finite element computer program. Elastic solutions from MARC showed good agreement with previously reported solutions obtained by using the NASTRAN and ISO3DQ computer programs. Equivalent total strain ranges at the critical locations calculated by elastic analyses agreed within 3 percent with those calculated from elastic-plastic analyses. The elastic analyses always resulted in compressive mean stresses at the critical locations. However, elastic-plastic analyses showed tensile mean stresses for two of the four alloys and an increase in the compressive mean stress for the highest plastic strain case. M.G.

N82-20567*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

DESIGN DETAIL VERIFICATION TESTS FOR A LIGHTLY LOADED OPEN-CORRUGATION GRAPHITE-EPOXY CYLINDER

Randall C. Davis and James H. Starnes, Jr. Mar. 1982 26 p refs

(NASA-TP-1981; L-14795; NAS 1.60:1981) Avail: NTIS HC A03/MF A01 CSCL 20K

Flat corrugated graphite-epoxy panels were tested in compression to verify selected design details of a ring-stiffened cylinder that was designed to support an axial compressive load of 157.6 kN/m without buckling. Three different sizes of subcomponent panels, with the same basic corrugation geometry, were tested: (1) 60.96-cm-long by 45.72-cm-wide panels to evaluate the local buckling strength of the shell wall design; (2) 91.44-cm-long by 45.72-cm-wide panels to evaluate a longitudinal joint and the load-introduction method; and (3) 254.0-cm-long by 91.44-cm-wide panels with four simulated-ring stiffeners to evaluate the ring-attachment method. The test results indicate that the modified shell-wall design, the longitudinal joint, the load-introduction method, and the stiffener-attachment method for the proposed cylinder have adequate strength to support the design load. Author

N82-20568# Washington State Univ., Pullman. Dept. of Physics.

CRACK VELOCITY DEPENDENCE OF ELECTRON EMISSION DURING FRACTURE OF FILLED ELASTOMERS

J. T. Dickinson and L. C. Jensen 15 Nov. 1981 27 p (Contract N00014-80-C-0213; NR Proj. 092-558)

(AD-A108446; TR-4) Avail: NTIS HC A03/MF A01 CSCL 11/9

The electron emission accompanying the fracture of filled elastomers, shown in previous work to be intense and due predominately to interfacial failure was examined. It is shown that there is a strong velocity dependence on the rate of electron emission during the propagation of a crack in filled silicon rubber and polybutadiene filled with glass beads. It is proposed that the concentration of free radicals produced by crack propagation increases rapidly with crack velocity which in turn produces more intense electron emission by a chemi-emission mechanism. M.D.K.

N82-20569# Naval Ship Research and Development Center, Bethesda, Md.

POSTPROCESSING OF ADINA STRAINS Final Report

Theodore G. Toridis (George Washington Univ., Washington, D.C.), Peter N. Roth, and Jane H. Judy Dec. 1981 29 p refs (SF43400001)

(AD-A109444; DTNSRDC-81/071) Avail: NTIS HC A03/MF A01 CSCL 20/11

A procedure has been developed for processing the strains available with the computer program ADINA to provide strain

output in any desired orientation and to calculate and output strains on the surface of a three dimensional solid or shell element. To this end, proper additions and modifications have been made to ADINA to implement the procedure directly within the program to allow for the processing and output of strains during the normal execution stage. This includes reading in additional input data (of minimum amount), transformation of strains from the global system to specified coordinate directions, the output of transformed strains, and the calculation and output of surface strains based on the interpolation functions available in ADINA. At the present time such capabilities are provided for a limited number of elements on a selective basis, in order to minimize the amount of computer storage required. Some typical structures have been analyzed to compute and output strains both at interior points and on exterior surfaces of elements, for a set of elements specified by the user during the input stage. Results demonstrate the feasibility of the procedure for the transformation and extrapolation of strains. Author (GRA)

N82-20570# Dayton Univ., Ohio.
IMPACT DAMAGE ON VARIOUS METAL LEADING EDGES FROM SMALL HARD OBJECTS Final Report, Mar. - Nov. 1979
Robert S. Bertke Wright-Patterson AFB, Ohio AFWAL Aug. 1981 113 p refs
(Contract F33615-76-C-5124; AF Proj. 7351)
(AD-A109676; UDR-TR-81-06; AFWAL-TR-81-4066) Avail: NTIS HC A06/MF A01 CSCL 11/6

Impact damage on various metal leading edge configurations was studied by performing a series of hard particle impact tests and characterizing the damage. Fatigue tests were used to assess the damage and the concept of an equivalent elastic stress concentration factor was used to characterize severity of damage. Notch fatigue specimens were also fatigue tested in tension to provide baseline data for each material investigated. The materials investigated included 8Al-1Mo-1V titanium, 4130 steel in the annealed and heat-treated conditions, and 7075-T651 aluminum. The data demonstrated good reproducibility and showed that the extent of a particular type of damage could be categorized in terms of an equivalent elastic stress concentration factor. The 4130 steel was superior in performance. The concept of geometric scaling was investigated by performing a series of tests using different leading edge thickness and projectile sizes. Observation of the type of damage and plots of critical velocity versus particle size appeared to validate the scaling concepts. GRA

N82-20571# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
DEVELOPMENT OF PROCEDURES FOR NONDESTRUCTIVE TESTING OF CONCRETE STRUCTURES. REPORT 3: FEASIBILITY OF IMPACT TECHNIQUE FOR MAKING RESONANT FREQUENCY MEASUREMENTS
A. Michel Alexander Nov. 1981 36 p refs
(AD-A109814; WES-MP-C-77-11-3) Avail: NTIS HC A03/MF A01 CSCL 11/2

The resonant frequency technique as a method for evaluation of concrete structures was developed. The availability of digital Fourier analyzers and mathematical functions such as spectra, coherence, and transfer relationships permits the analysis of the behavior of large structures under dynamic conditions in place and in real time. An impact system was tested which is economical and versatile. The resonant frequency of a structure is directly related to its dynamic Young's modulus and its mechanical integrity; the resonant frequency technique is useful in the field as well as in the laboratory. Mathematical and physical models to develop measurement criteria that improve prediction of the expected resonant frequency for structures with varying geometries and varying degrees of foundation restraint are discussed. The characteristic vibrational signature of a structure is evaluated at selected time intervals to predict service life. E.A.K.

N82-20572# Pennsylvania Univ., Philadelphia. Dept. of Materials Science and Engineering.
MECHANISMS OF DAMAGE ACCUMULATION IN TIME-DEPENDENT CYCLIC DEFORMATION Progress Report, 1 Jan. - 31 Dec. 1981
Campbell Laird Jul. 1981 19 p refs
(Contract DE-AC02-80ER-10570)
(DE82-002970; DOE/ER-10570/2) Avail: NTIS HC A02/MF A01

Cyclic creep and time dependent cyclic deformation which are increasingly recognized in machines used for energy conversion and storage, and exploration of the relevant damage phenomena was studied. Two kinds of damage produced in cyclic creep were investigated: (1) change in dislocation density and arrangement, to be studied in copper; and (2) damage phenomena perhaps involving precipitates in Cr-Mo-V rotor steel. In copper tested at low temperatures, strain bursts are recognized for the first time in polycrystals of a pure metal in both cyclic and static creep. The stress regime for producing bursts is defined, and the dislocation structures associated with bursts and cyclic creep is studied. Instabilities associated with the persistent slip bands which form in regular fatigue are explored. For the study of rotor steel, three batches of materials are obtained and characterized and a new high temperature apparatus is built for testing. DOE

N82-20573# Sandia Labs., Albuquerque, N. Mex.
APPROACH TO THE FATIGUE ANALYSIS OF VERTICAL-AXIS WIND-TURBINE BLADES
P. S. Veers Sep. 1981 35 p refs
(Contract DE-AC04-76DP-00789)
(DE82-003193; SAND-81-2130) Avail: NTIS HC A03/MF A01

The stress history of wind turbine blades indicates that a single stress level at each wind speed does not adequately describe the blade stress history and a statistical description is required. Blade stress data from experimental turbines indicate that the Rayleigh probability density function describes the distribution of vibratory stresses at each wind speed. The Rayleigh probability density function allows the distribution of vibratory stresses to be described by the RMS of the stress vs. time signal. With the RMS stress level described for all wind speeds, the complete stress history of the turbine blades is known. Miner's linear cumulative damage rule is used as a basis for summing the fatigue damage over all operating conditions. An analytical expression is derived to predict blade fatigue life. DOE

N82-20574 Yale Univ., New Haven, Conn.
CASE STUDIES IN PLASTICITY Ph.D. Thesis
Wendell Andrews Kawahara 1981 147 p
Avail: Univ. Microfilms Order No. 8125682

The microyield response of 1100 to 0 aluminum to thermal cycling under fixed external stress and a numerical comparison of three different overstress type constitutive models of viscoplasticity are studied. A thermal cycle induces motion of the room temperature yield curve; the side of the yield curve on which the thermal cycle is performed moves more than does the opposite side. The sign of the net strain change produced by a thermal cycle is more consistently predictable if recoverable anelastic strains can be frozen into the material. The isothermal response of a thickwalled plane strain cylindrical tube to rapid cycles of internal pressure in the absence of inertia effects is investigated. The predicted response of three different overstress type viscoplasticity models which incorporate yield surfaces are compared. Dissert. Abstr.

N82-20341# Office National d'Etudes et de Recherches Aeronautiques, Paris (France). Acoustique Div.
MODERN DATA ANALYSIS TECHNIQUES IN NOISE AND VIBRATION PROBLEMS WITH PARTICULAR EMPHASIS ON AEROACOUSTIC APPLICATIONS
M. Perulli *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 1-11 refs In FRENCH; ENGLISH summary (For primary document see N82-20340 11-31)
Avail: NTIS HC A08/MF A01

N82-20342# Southampton Univ. (England). Inst. of Sound and Vibration Research.
FLUCTUATING STRESS FIELDS IN CONTINUOUS MEDIA
P. E. Doak *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 12-18 (For primary document see N82-20340 11-31)
Avail: NTIS HC A08/MF A01

N82-20349# Southampton Univ. (England). Inst. of Sound and Vibration Research.
THE APPLICATION OF STATISTICAL ENERGY ANALYSIS TO VIBRATION OF STRUCTURES EXCITED ACOUSTICALLY
B. L. Clarkson *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 76-79 refs (For primary document see N82-20340 11-31)
Avail: NTIS HC A08/MF A01

N82-20352# Southampton Univ. (England). Inst. of Sound and Vibration Research.
NON-STATIONARITY AND NONLINEARITY IN DATA ANALYSIS
J. K. Hammond *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 107-116 refs (For primary document see N82-20340 11-31)
Avail: NTIS HC A08/MF A01

N82-20353# Southampton Univ. (England). Inst. of Sound and Vibration Research.
PARAMETRIC METHODS IN SIGNAL ANALYSIS
J. K. Hammond *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 117-123 refs (For primary document see N82-20340 11-31)
Avail: NTIS HC A08/MF A01

N82-20354# Technische Univ., Berlin (West Germany). Inst. fuer Technische Akustik.
VIBRATION TRANSMISSION AND SOUND RADIATION
M. Heckl *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 124-141 refs (For primary document see N82-20340 11-31)
Avail: NTIS HC A08/MF A01

N82-20356# Hewlett-Packard France, Les Ulis (France).
MODAL ANALYSIS USING DIGITAL TEST EQUIPMENT
Patrick Garcia *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 151-159 refs (For primary document see N82-20340 11-31)
Avail: NTIS HC A08/MF A01

42 GEOSCIENCES (GENERAL)

N82-20575# Deutsches Geodaetisches Forschungsinstitut, Munich (West Germany).
CONTRIBUTIONS FROM THE FEDERAL REPUBLIC OF GERMANY TO THE 17TH GENERAL ASSEMBLY OF THE INTERNATIONAL UNION FOR GEODESY AND GEOPHYSICS [BEITRAEGE AUS DER BUNDESREPUBLIK DEUTSCHLAND ZUR VORLAGE BEI DER 17. GENERALVERSAMMLUNG DER INTERNATIONALEN UNION FUER GEODAESIE UND GEOPHYSIK]
1980 121 p refs Presented at Canberra, Australia, 2-14 Dec. 1979
(Ser-B-252; ISSN-0065-5317; ISBN-3-7696-8544-X) Avail: NTIS HC A06/MF A01

Network synthesis, where free adjustment, optimization of quality and extension of continental networks beyond the shore lines is performed, is treated. Geoid determination, with theoretical investigations on the boundary value problem solution by means of the vertical gradient of gravity and an experimental contribution making use of combination techniques is discussed. Geodetical measurements and techniques, with results on absolute deflections from the vertical and error analyses concerning the weights of meteorologically influenced measurements and calibration errors of gravimeters are studied. For individual titles, see N82-20576 through N82-20583.

N82-20576# Bayerische Akademie der Wissenschaften, Munich (West Germany).
ABSOLUTE DEFLECTIONS OF THE VERTICAL IN THE RHINEGRABEN AREA **c46**
C. Gerstenecker, E. Groten, G. Hein, K. Lenze, and H. Schaab *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union for Geodesy and Geophys. 1980 p 3-19 refs (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

Absolute deflections of the vertical are evaluated from free air gravity anomalies by applying Molodensky's solution of the geodetic boundary value problem in terms of Moritz's gradient formulas and are compared with astrogeodetic plumb line deflections. For the remote zones, global geopotential models have been used.. The contribution of the nearest neighborhood topography is shown to be more important than previously found. Numerical values of (ksi, etc.) are discussed and the accuracy of the deflections is estimated to be of the order of + or - 0.8 sec. Remaining uncertainties are caused by still unexplained discrepancies of global models as well as the nearest neighborhood in case of extreme topography around the station. Author (ESA)

N82-20577# Bayerische Akademie der Wissenschaften, Munich (West Germany).
SOLUTION OF THE GEODECTIC BOUNDARY VALUE PROBLEM BY MEANS OF THE VERTICAL GRADIENT OF GRAVITY **c46**
Bernhard Heck *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union for Geodesy and Geophys. 1980 p 21-28 refs (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

The geodetic boundary value problem starting from the second derivative of the gravity potential in the direction of the plumb line is formulated. The development of high precision gravity gradiometers opens the prospect of improving the local geoid determination using the proposed procedure. By representing the disturbing potential by the potential of a simple surface distribution, an integrodifferential equation is obtained which is solved by Molodensky's method. Error analysis shows that height anomaly differences between points up to 50 km apart can be determined with centimeter precision. The high accuracy makes the method particularly adaptable for interpretation of local geodynamic effects. Author (ESA)

N82-20578# Bayerische Akademie der Wissenschaften, Munich (West Germany).
THE ESTIMATION OF WEIGHTS OF METEOROLOGICALLY INFLUENCED MEASUREMENTS **c47**
Heribert Kahmen *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union of Geodesy and Geophys. 1980 p 29-39 refs (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

The weight determination of trigonometrical height or electronic distance measurements influence by the meteorological field is investigated. As fluctuations of refraction coefficients and indices are recognized as stochastic processes, the weights obtained by applying the classical error propagation law are compared with predictions from stochastic process theory. Time and ray path length dependences of the stochastical models are discussed. Model studies based on stochastical theory are shown to support the various practical findings. Author (ESA)

N82-20579# Bayerische Akademie der Wissenschaften, Munich (West Germany).
FREE NETWORK ADJUSTMENT AND S-TRANSFORMATIONS **c64**
Jan VanMierlo *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union of Geodesy and Geophys. 1980 p 41-54 refs (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

The least squares, minimum norm technique for solving the problem of the adjustment of free geodetic networks characterized by singular normal equations is discussed. A nonunique biased solution of the singular normal equations is transformed into estimable quantities which can be interpreted as coordinates. Such transformations are called s transformations which are shown to be particularly applicable to the solution of normal equations of less than full rank and to the transformation of regular covariance criterium matrices into singular ones. Author (ESA)

N82-20580# Bayerische Akademie der Wissenschaften, Munich (West Germany).
SOME CRITERIA FOR THE ACCURACY AND THE RELIABILITY OF NETWORKS **c43**
Hans Pelzer *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union of Geodesy and Geophys. 1980 p 55-67 refs (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

Design criteria for optimizing the quality of a geodetic network, taking both the functional and the stochastic model of the network into account, are derived. An effective global accuracy criterion is shown to be obtainable from the maximum eigenvalue of the cofactor matrix of the vector of points coordinates. The essential eigenvectors of the same matrix are identified as indicators for functions with maximum variance. A reliability criterion can be obtained by means of a reliability parameter constructed by gross error testing of each observation. To this end a nomogram is made available. Author (ESA)

N82-20581# Bayerische Akademie der Wissenschaften, Munich (West Germany).
EXPERIMENTS IN SATELLITE DOPPLER CONTROL POSITIONING AT SEA **c43**
Guenter Seeber, Delf Egge, and Hans Werner Schenke *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union of Geodesy and Geophys. 1980 p 69-80 refs Sponsored by Bundesministerium fuer Forschung- und Technologie and Deutsche Forschungsgeimschaft (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

Experiments on the application of the transit satellite system, which utilizes Doppler control positioning, for an extension of classical continental geodetic networks beyong the shore lines are described. The experiments were conducted in the North Sea area and deal with: (1) fixed point positioning on a platform; (2) positioning of a moored buoy; (3) positioning of a drifting buoy. The evaluation indicates that for fixed or stationary motion conditions no accuracy decrease occurs provided an accumulated solution is made. For nonstationary motion one has to resort to position fixes with single satellite passes so that no accumulated increase of precision can be obtained. Experiments to assess the inherent accuracy of the Doppler satellite method in a single pass solution are presently underway. Author (ESA)

N82-20582# Bayerische Akademie der Wissenschaften, Munich (West Germany).
PERIODIC CALIBRATION ERRORS OF LACOSTE-ROMBERG MODEL G AND D GRAVITY METERS **c46**
W. Jorge and E. Kanngieser *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union for Geodesy and Geophys. 1980 P 81-94 refs Sponsored by Deutsche Forschungsgeimschaft (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

Different calibration lines were established and used for the determination of periodic calibration errors of several Lacoste-Romberg gravity meters. These lines comprise: (1) a 20 mgal vertical line with I 1 microgal accuracy; (2) a 200 mgal horizontal line with I 3 microgal accuracy; (3) the absolute gravity stations in Germany and Northern Europe constituting 600 and 1200 mgal lines for linear respectively long periodic calibration terms. Signifiant terms are found mainly for the periods 1, 7.9, 35 and 71 mgal, with amplitudes between 3 and 20 microgal. Further results are given on linear and long periodic terms and their dependence on reset position. Systematic deviations between different instruments disappear almost completely when the detected periodic terms are introduced. Author (ESA)

N82-20583# Bayerische Akademie der Wissenschaften, Munich (West Germany).
RECENT RESULTS OF GEOID DETERMINATION BY COMBINATION TECHNIQUES IN THE NORTH SEA TEST AREA **c43**
Hans-Georg Wenzel *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union of Geodesy and Geophys. 1980 p 95-121 refs Sponsored by Deutsche Forschungsgeimschaft (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

Gravity anomalies, GEOS 3 satellite altimetry and astrogeodetic vertical deflections were used to determine gravimetric, altimetric and astrogeodetic geoids in the North Sea test area. The agreement between these independent geoids is below the 1 m level and no sea surface topography could be detected. Simple averaging techniques, and stokes and least square collocations are used to determine combined geoids with an accuracy believed to be below the 0.5 m level. Author (ESA)

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.

For instrumentation see *35 Instrumentation and Photography*.

N82-20584 Texas Univ. at Arlington.
VALUE OF DATA IN RELATION TO UNCERTAINTY AND RISK Ph.D. Thesis
Upmanu Lall 1981 299 p
Avail: Univ. Microfilms Order No. 8128652

In statistical estimation techniques were reviewed and refined to reduce the bias and uncertainty associated with sample statistics and expected probabilities. The incremental value of data was assessed in the context of probability levels, length of record and project life. The relative importance of estimation uncertainty and predictive risk were demonstrated and event and error distributions evaluated for probabilistic magnitudes. The Pearson Type III, Normal and Annual Maximum Flood distributions were investigated analytically and experimentally under this framework. The results of the study are applicable to both structural and non-structural management of natural disaster phenomena, with particular emphasis on flood control. Dissert. Abstr.

N82-20585*# Wisconsin Univ., Madison.
INVESTIGATION OF ANTARCTIC CRUST AND UPPER MANTLE USING MAGSAT AND OTHER GEOPHYSICAL DATA Quarterly Progress Report
C. R. Bentley, Principal Investigator 9 Sep. 1981 2 p refs ERTS
(Contract NAS5-25977)
(E82-10062; NASA-CR-165084; NAS 1.26:165084; QPR-6)
Avail: NTIS HC A02/MF A01 CSCL 08G

Progress in processing and analysis of Investigator B MAGSAT data is reported. Data processing tasks required prior to data analysis, including translation and reformatting of tapes and development of computer routines, were performed. A scalar anomaly map of Antarctica is near completion. Data analysis included a qualitative correlation of NASA's 4/81 scalar map of Antarctica with other geopotential data and correlation of POGO and continental scale gravity data with MAGSAT data. A magnetic high was found to exist over the Ross Embayment. J.D.H.

N82-20586*# Brigham Young Univ., Provo, Utah.
HCMM HYDROLOGICAL ANALYSIS IN UTAH
3 Sep. 1981 37 p refs Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20071. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A from Rockets and Satellites'. HCMM
(E82-10063; NASA-CR-165085; NAS 1.26:165085; QR-2)
Avail: NTIS HC A03/MF A01 CSCL 08H

Progress in analysis of Heat Capacity Mapping Mission (HCMM) infrared and visible observations of the hydrology of Utah Lake is reported. Correlation between HCMM intensities converted to temperature and ground truth temperatures was investigated, and a conversion offset value determined. Ground truth surface temperatures minus HCMM temperatures were plotted against several hydrological parameters. Relationships among visible data, thermal data, and algae concentrations were considered, and summer concentrations of predominant algae species determined. Investigations on the effects of varying algae concentrations on evaporation rates are reported. Efforts to develop

a model for evaporation estimation are reported. The relationship between air and water surface temperatures was studied and the temperature distribution in different segments of the lake investigated. Indications of the existence of thermal springs are reported. Correlation of HCMM surface temperature data and depth to groundwater were investigated. J.D.H.

N82-20587*# National Oceanic and Atmospheric Administration, Washington, D. C.
EVALUATION OF HCMM SATELLITE DATA FOR ESTUARINE TIDAL CIRCULATION PATTERNS AND THERMAL INERTIA SOIL MOISTURE MEASUREMENTS Final Report
Donald R. Wiesnet, David F. McGinnis, Jr., Principal Investigators, Michael Matson, and John A. Pritchard Jun. 1981 79 p refs Original contains color imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20071. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM
(NASA Order S-40229B)
(E82-10064; NASA-CR-165086; NAS 1.26:165086) Avail: NTIS HC A05/MF A01 CSCL 08C

Digital thermal maps of the Cooper River (SC) and the Potomac River estuaries were prepared from heat capacity mapping radiometer (HCMR) tapes. Tidal phases were correctly interpreted and verified. Synoptic surface circulation patterns were charted by location thermal fronts and water mass boundaries within the estuaries. Thermal anomalies were detected adjacent of a conventional power plant on the Potomac. Under optimum conditions, estuaries as small as the Cooper River can be monitored for generalized thermal/tidal circulation patterns by the HCMM-type IR sensors. The HCMM thermal inertia approach to estimating soil moisture at the Luverne (MN) test site was found to be unsatisfactory as a NESS operational satellite technique because of cloud cover interference. Thermal-IR data show similar structure of the Baltimore and Washington heat islands when compared to NOAA AVHHR thermal-IR data. Thermal anomalies from the warm water discharge water of a nuclear power plant were mapped in Lake Anna, Virginia. A.R.H.

N82-20588*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE UTILIZATION OF ORBITAL IMAGES AS AN ADEQUATE FORM OF CONTROL OF PRESERVED AREAS [UTILIZACAO DE IMAGENS ORBITAIS, COMO FORMA ADEQUADA NO CONTROLE DE AREAS DE PRESERVACAO]
Nelson deJesusParada, Principal Investigator and Joao Roberto dosSantos May 1981 14 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA; submitted for publication ERTS
(E82-10065; NASA-CR-165087; NAS 1.26:165087; INPE-2064-RPE/306) Avail: NTIS HC A02/MF A01 CSCL 08B

The synoptic view and the repetitive acquisition of LANDSAT imagery provide precise information, in real-time, for monitoring preserved areas based on spectral, temporal and spatial properties. The purpose of this study was to monitor, with the use of multispectral imagery, the systematic annual burning, which causes the degradation of ecosystems in the National Park of Araguaia. LANDSAT imagery of channel 5 (0.6 a 0.7 microns) and 7 (0.8 a 1.1 microns), at the scale of 1:250.000, were used to identify and delimit vegetation units and burned area, based on photointerpretation parameter of tonality. The results show that the gallery forest can be discriminated from the seasonally flooded 'campo cerrado', and that 4,14% of the study area was burned. Conclusions point out that the LANDSAT images can be used for the implementation of environmental protection in national parks. Author

N82-20589*# Analytic Sciences Corp., Reading, Mass.
[MAGSAT ANOMALY PROFILES OF THE EASTERN INDIAN OCEAN] Quarterly Progress Report, 1 Apr. - 30 Jun. 1981
Richard V. Sailor, Principal Investigator and Andrew R. Lazarewicz 15 Aug. 1981 21 p refs ERTS
(Contract NAS5-26424)
(E82-10066; NASA-CR-165088; NAS 1.26:165088; PR-1325-2) Avail: NTIS HC A02/MF A01 CSCL 05B

Ground tracks from SEASAT were used in an effort to develop qualititative relationships between the gravity field and MAGSAT magnetic anomalies in the eastern Indian Ocean. Investigation of data quality led to analyses of the average value (over 80 vector data points, or approximately 36 km intervals) and of the standard deviation of this average, as a mean of identifying noisy portions of the data. It was discovered that the plots of the average value minus the individual (measured) point value are most useful for identifying noisy areas and data spikes. Spectrum analysis using edited (spikes removed) data show that the noise floor is less than 1 nT and the slope of the spectrum in the region of wavelengths between 1200 km and 250 km is approximately -3. Consequently the estimated resolution limit improved from approximately 360 km to approximately 250 km. A.R.H.

N82-20590*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
EVALUATION OF A SEGMENT-BASED LANDSAT FULL-FRAME APPROACH TO CORP AREA ESTIMATION
M. E. Bauer, Principal Investigator, M. M. Hixson, and S. M. Davis 23 Jun. 1981 22 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15466; Proj. AgRISTARS)
(E82-10067; NASA-CR-167400; NAS 1.26:167400; FC-P1-04121; LARS-062381) Avail: NTIS HC A02/MF A01 CSCL 02C

As the registration of LANDSAT full frames enters the realm of current technology, sampling methods should be examined which utilize other than the segment data used for LACIE. The effect of separating the functions of sampling for training and sampling for area estimation. The frame selected for analysis was acquired over north central Iowa on August 9, 1978. A stratification of he full-frame was defined. Training data came from segments within the frame. Two classification and estimation procedures were compared: statistics developed on one segment were used to classify that segment, and pooled statistics from the segments were used to classify a systematic sample of pixels. Comparisons to USDA/ESCS estimates illustrate that the full-frame sampling approach can provide accurate and precise area estimates. A.R.H.

N82-20591*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
EFFECTS OF NITROGEN NUTRITION ON THE GROWTH, YIELD AND REFLECTANCE CHARACTERISTICS OF CORN CANOPIES
M. E. Bauer, Principal Investigator, G. Walburg, and C. S. T. Daughtry May 1981 22 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15466; Proj. AgRISTARS)
(E82-10068; NASA-CR-165090; NAS 1.26:165090; SR-P1-04044; LARS-030381) Avail: NTIS HC A02/MF A01 CSCL 02C

Spectral and agronomic measurements were collected from corn (Zea mays L.) canopies under four nitrogen treatment levels (0, 67, 134, and 202 kg/ha) on 11 dates during 1978 and 12 dates during 1979. Data were analyzed to determine the relationship between the spectral responses of canopies and their argonomic characteristics as well as the spectral separability of the four treatments. Red reflectance was increased, while the near infrared reflectance was decreased for canopies under nitrogen deprivation. Spectral differences between treatments were seen throughout each growing season. The near infrared/red reflectance ratio increased spectral treatment differences over those shown by single band reflectance measures. Of the spectral variables examined, the near infrared/red reflectance ratio most effectively separated the treatments. Differences in spectral response between treatments were attributed to varying soil cover, leaf area index, and leaf pigmentation values, all of which changed with N treatment. A.R.H.

N82-20592*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
AMAZONAS PROJECT: APPLICATION OF REMOTE SENSING TECHNIQUES FOR THE INTEGRATED SURVEY

OF NATURAL RESOURCES IN AMAZONAS [PROJETO AMAZONAS APLICACAO DAS TECNICAS DE SENSORIAMENTO REMOTO PARA LEVANTAMENTO INTEGRADO DOS RECURSOS NATURAIS DO AMAZONAS]

Nelson deJesusParada, Principal Investigator Mar. 1981 95 p refs In PORTUGUESE Sponsored by NASA ERTS

(E82-10069; NASA-CR-165091; NAS 1.26:165091; INPE-2019-NTE/166) Avail: NTIS HC A05/MF A01 CSCL 08F

The use of LANDSAT multispectral scanner and return beam vidicon imagery for surveying the natural resources of the Brazilian Amazonas is described. Purposes of the Amazonas development project are summarized. The application of LANDSAT imagery to identification of vegetation coverage and soil use, identification of soil types, geomorphology, and geology and highway planning is discussed. An evaluation of the worth of LANDSAT imagery in mapping the region is presented. Maps generated by the project are included. J.D.H.

N82-20593*# Canada Centre for Remote Sensing, Ottawa (Ontario).

HEAT CAPACITY MAPPING MISSION (HCMM): INTERPRETATION OF IMAGERY OVER CANADA Final Report

Josef Cihlar, Principal Investigator and R. G. Dixon Aug. 1981 72 p refs Sponsored by NASA Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20771. Domestic users send order to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM

(E82-10070; NASA-CR-165092; NAS 1.26:165092) Avail: NTIS HC A04/MF A01 CSCL 05B

Visual analysis of HCMM images acquired over two sites in Canada and supporting aircraft and ground data obtained at a smaller subsite in Alberta show that nightime surface temperature distribution is primarily related to the near-surface air temperature; the effects of topography, wind, and land cover were low or indirect through air temperature. Surface cover and large altitudinal differences were important parameters influencing daytime apparent temperature values. A quantitative analysis of the relationship between the antecedent precipitation index and the satellite thermal IR measurements did not yield statistically significant correlation coefficients, but the correlations had a definite temporal trend which could be related to the increasing uniformity of vegetation cover. The large pixel size (resulting in a mixture of cover types and soil/canopy temperatures measured by the satellite) and high cloud cover frequency found in images covering both Canadian sites and northern U.S. were considered the main deficiencies of the thermal satellite data. A.R.H.

N82-20594*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

SURVEY OF THE CANE-GROWING AREA OF THE STATE OF SAO PAULO USING LANDSAT DATA, SAFRA YEAR 1979/80, VOLUME 2 [LEVANTAMENTO JA AREA CANAVIEIRA DO ESTADO DE SAO PAULO, UTILIZANDO DADOS DO LANDSAT AND SAFRA 1979/80, VOLUME 2]

Nelson deJesusParada, Principal Investigator, Francisco Jose Mendonca, David Chung Liang Lee, Antonio Tebaldi Tardin, Yosio Edemir Shimabukuro, Sherry Chou Chen, Liane Antunes Maciel Lucht, Mauricio Alves Moreira, Angela Maria deLima, and Fernando Celso Soares Maia Mar. 1981 63 p In PORTUGUESE ERTS

(E82-10071; NASA-CR-165093; NAS 1.26:165093; INPE-2021-RPE/288) Avail: NTIS HC A04/MF A01 CSCL 02C

Maps indicating areas of sugar cane cultivation in the state of Sao Paulo, Brazil are presented. J.D.H.

N82-20595*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

LAND USE IN THE PARAIBA VALLEY THROUGH REMOTELY SENSED DATA [USO DA TERRA NO VALE DO PARAIBA ATRAVES DE DADOS DE SENSORIAMENTO REMOTO - RELATORIO FINAL]

Nelson deJesusParada, Principal Investigator, Magda Adelaide Lombardo, Evlyn Marcia Leao deMoraes Novo, Madalena Niero, and Celina Foresti Dec. 1980 95 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198. ERTS

(E82-10072; NASA-CR-165094; NAS 1.26:165094; INPE-1972-RPE/278) Avail: NTIS HC A05/MF A01 CSCL 08B

A methodology for land use survey was developed and land use modification rates were determined using LANDSAT imagery of the Paraiba Valley (state of Sao Paulo). Both visual and automatic interpretation methods were employed to analyze seven land use classes: urban area, industrial area, bare soil, cultivated area, pastureland, reforestation and natural vegetation. By means of visual interpretation, little spectral differences are observed among those classes. The automatic classification of LANDSAT MSS data using maximum likelihood algorithm shows a 39% average error of omission and a 3.4% error of inclusion for the seven classes. The complexity of land uses in the study area, the large spectral variations of analyzed classes, and the low resolution of LANDSAT data influenced the classification results. A.R.H.

N82-20596*# Consiglio Nazionale delle Ricerche, Milan (Italy).

HEAT CAPACITY MAPPING MISSION (HCMM) PROGRAM: STUDY OF GEOLOGICAL STRUCTURE OF SICILY AND OTHER ITALIAN AREAS Final Report

Roberto Cassinis, Giovanni Lechi, Principal Investigators, Eugenio Zilioli, Alberto Marini, Pietro A. Brivio, and Nicola Tosi Aug. 1981 34 p refs Sponsored by NASA Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20771. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM

(E82-10073; NASA-CR-165095; NAS 1.26:165095) Avail: NTIS HC A03/MF A01 CSCL 05B

The usefulness of thermal inertia mapping in discriminating geolithological units was investigated using Sardinia and the Gulf of Orosei as test sites. Software designed for LANDSAT data were modified and improved for HCMM tapes. A first attempt was made to compare the geological cross section, the topography, the IR radiance, and the thermal inertia along selected profiles of the test site. Thermal inertia profiles appear smoothed in comparison with the thermal radiance. The lowest apparent thermal inertia (ATI) was found on granitic and basaltic outcrops where their image is of sufficient extent, while ATI is higher on carbonatic and dolomitic or moist deposits. Almost every fault is marked by a jump of ATI, the interval being sometimes of the order of one pixel. This seems to demonstrate the ability of ATI to detect contacts or tectonically disturbed zones with a good resolution. It seems more difficult to measure the differences in ATI between homogeneous materials having different lithology. Ground surveys conducted and a simulation model of diurnal temperatures of rocks having different thermal inertia are discussed. A.R.H.

N82-20597*# Texas A&M Univ., College Station. Remote Sensing Center.

DRYLAND PASTURE AND CROP CONDITIONS AS SEEN BY HCMM Final Report, Jan. 1978 - Jan. 1981

J. C. Harlan, Principal Investigator, W. D. Rosenthal, and B. J. Blanchard Apr. 1981 8 p refs Sponsored by NASA HCMM

(E82-10074; NASA-CR-165096; NAS 1.26:165096) Avail: NTIS HC A02/MF A01 CSCL 08F

The antecedent precipitation index (API) was related to surface temperatures as measured from the NASA C-130 and HCMM thermal data. Significant results from the aircraft flight in May 1978, include: (1) canopy temperature were measured accurately remotely; (2) pasture surface temperatures were related to pasture and wheat soil moisture conditions; (3) no relationship was developed with that data set between wheat yield and thermal infrared data due to a lack of moisture stress during the measurement period; and (4) lake surface temperatures were useful in normalizing the thermal IR data. Results from HCMM also suggested a relationship between thermal IR data and antecedent precipitation index. While HCMM was adequate in detecting relative soil moisture differences, the overpass timing was infrequent and prevented detailed analysis of the API/thermal relationship. A.R.H.

N82-20598*# Liverpool Univ. (England).
SPHERICAL HARMONIC REPRESENTATION OF THE MAIN GEOMAGNETIC FIELD FOR WORLD CHARTING AND INVESTIGATIONS OF SOME FUNDAMENTAL PROBLEMS OF PHYSICS AND GEOPHYSICS Progress Report
D. R. Barraclough, R. Hide, B. R. Leaton, F. J. Lowes, S. R. C. Malin, and R. L. Wilson, Principal Investigators 1 Oct. 1981 8 p refs Sponsored by NASA ERTS
(E82-10075; NASA-CR-165097; NAS 1.26:165097) Avail: NTIS HC A02/MF A01 CSCL 08G

Quiet-day data from MAGSAT were examined for effects which might test the validity of Maxwell's equations. Both external and toroidal fields which might represent a violation of the equations appear to exist, well within the associated errors. The external field might be associated with the ring current, and varies of a time-scale of one day or less. Its orientation is parallel to the geomagetic dipole. The toriodal field can be confused with an orientation in error (in yaw). It the toroidal field really exists, its can be related to either ionospheric currents, or to toroidal fields in the Earth's core in accordance with Einstein's unified field theory, or to both. Author

N82-20599*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
STUDY PROJECT OF INTRUSIVE ROCKS: STATES OF ESPIRITO SANTO AND RIO DE JANEIRO, SOUTH AND EAST OF MINAS GERAIS AND SOUTHEAST OF THE STATE OF SAO PAULO [PROJETO ESTUDO DAS ROCHAS INTRUSIVAS: ESTADOS DO ESPIRITO SANTO E DU RIO DE JANEIRO, PARTES SUL E LESTE DE MINAS GERAIS E SUDESTE DO ESTADO DE SAO PAULO]
Nelson deJesusParada, Principal Investigator, Athos Ribeiro dosSantos, Celio Eustaquio dos Anjos, Marx Prestes Barbos, and Paulo Veneziani Jul. 1981 19 p refs In PORTUGUESE; ENGLISH summary Presented at the 3rd Simposio Regional de Geol., Curitiba, Brazil, 12-15 Nov. 1981 Sponsored by NASA ERTS
(E82-10076; NASA-CR-168397; NAS 1.26:168397; INPE-2190-RPE/002) Avail: NTIS HC A02/MF A01 CSCL 08B

The feasibility of mapping intrusive rocks in polycyclic and polymetamorphic areas using the logic method for photointerpretation of LANDSAT and radar imagery was investigated. The resolution, scale and spectral characteristics of the imagery were considered. Spectral characteristics of the intrusive rock units mapped using image 100 were investigated. It was determined that identification of acidic and basic intrusive bodies and determination of their relationships with principal structural directions using the logic method was feasible. Tectonic compartments were subdivided into units according to their predominant lithographic types, ignoring stratigraphy. The principal directions of various foliations, faults, megafolds, and fractural systems were defined. Delineation of the boundaries of intrusive bodies mapped using the spectral characteristics of Image 100 imagery ws determined to be more accurate than visual analysis. A 1:500,000 scale map of intrusions in the areas studied was generated. J.D.H.

N82-20600*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
ELEVATION OF A CANE-GROWING AREA OF THE STATE OF SAO PAULO USING LANDSAT DATA [LEVANTAMENTO DA AREA CANAVIEIRA DO ESTADO DE SAO PAULO, UTLIZANDO DADOS DO LANDSAT ANO SAFRA: 1979/80]
Nelson deJesusParada, Principal Investigator, Francisco Jose Mendonca, David C. Liang Lee, Antonio Tebaldi Tardin, Yosio Edemir Shimabukuro, Sherry Chou Chen, Liane A. M. Lucht, Mauricio A. Moreira, Angela M deLima, and Fernando C. S. Maia Aug. 1981 10 p refs In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS
(E82-10077; NASA-CR-168398; NAS 1.26:168399; INPE-2199-RPE/007) Avail: NTIS HC A02/MF A01 CSCL 02C

Images at a scale of 1:250.000 were visually interpreted for identification and area estimates of sugar cane plantations in Sao Paulo. The basic criteria for crop identification were the spectral characteristics of channels 5 and 7 and their temporal variations observed from different LANDSAT passes. Using this technique, it was possible to map the sugar cane areas as well as the sugar cane already harvested. An area of 801,950 hectares was estimated within the study area. The confidence interval of correct classification ranged from 87.11% to 94.71%. T.M.

N82-20601*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
RELATION OF THE ACTIVITIES OF THE IPDF/INPE PROJECT (REFORESTATION SUBPROJECT) DURING THE YEAR 1979 [REALTORIO DAS ATIVIDADES DO PROJETO IBDF/INPE (SUBPROJETO REFLORESTAMENTO) DURANTE O ANO DE 179]
Nelson deJesusParada, Principal Investigator, Pedro Hernandez Filho, Yosio Edemir Shimabukuro, Jose Simeao deMedeiros, Carlito Chefer deSantana, and Eduardo Carlos Mignone Alves Aug. 1981 10 p In PORTUGUESE; ENGLISH summary Presented at the 11th Congr. Brasileiro de Engenharia Agricola, Brazil, 22-25 Jun. 1981 Sponsored by NASA ERTS
(E82-10078; NASA-CR-168399; NAS 1.26:168399; INPE-2196-RPE/005) Avail: NTIS HC A02/MF A01 CSCL 02F

The state of Mato Grosso do Sul was selected as the study area to define the recognizable classes of Eucalyptus spp. and Pinus spp. by visual and automatic analyses. For visual analysis, a preliminary interpretation key and a legend of 6 groups were derived. Based on these six groups, three final classes were defined for analysis: (1) area prepared for reforestation; (2) area reforested with Eucalyptus spp.; and (3) area reforested with Pinus spp. For automatic interpretation the area along the highway from Ribas do Rio Pardo to Agua Clara was classified into the following classes: eucalytus, bare soil, plowed soil, pine and 'cerrado'. The results of visual analysis show that 67% of the reforested farms have relative differences in area estimate below 5%, 22%, between 5% and 10%; and 11% between 10% and 20%. The reforested eucalyptus area is 17 times greater than the area of reforested pine. Automatic classification of eucalyptus ranged from 73.03% to 92.30% in the training areas. Author

N82-20602*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
SYSTEM OF FORECASTING AGRICULTURAL CROPS USING SATELLITE OBSERVATIONS OF EARTH [SISTEMA DE PREVISAO DE SAFRAS AERICOLAS UTILIZANDO SATELITES DE OBSERVACAO DA TERRA]
Nelson deJesusParada, Principal Investigator, Rene Antonio Novaes, Derli M. Silva, Luiz Gylvan Meira Filho, Mucio R. Dias, Oscar P. Dias, Jr., and Fausto C. deAlmeida Jul. 1981 38 p In PORTUGUESE; ENGLISH summary Sponsored by NASA ERTS
(E82-10079; NASA-CR-168400; NAS 1.26:168400; INPE-2163-RPE/381) Avail: NTIS HC A03/MF A01 CSCL 02C

A preliminary description of a crop forecasting system is presented. Ground and satellite observation are the main sources of data collection. T.M.

N82-20603*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE LANDSAT SYSTEM OPERATED IN BRAZIL BY CNPQ/INPE - RESULTS OBTAINED IN THE AREA OF MAPPING AND FUTURE PERSPECTIVES [O SISTEMA LANDSAT OPERADO NO BRASIL PELO CNPQ/INPE - RESULTADOS OBTIDOS NA AREA DE CARTOGRAFIA E PERSPECTIVAS FUTURAS]
Nelson deJesusParada, Principal Investigator and Marcio Nogueira Barbosa Jul. 1981 45 p refs In PORTUGUESE; ENGLISH summary Presented at the 10th Congr. Brasileiro de Cartografica, Brasil, 19-24 Jul. 1981 Sponsored by NASA ERTS
(E82-10080; NASA-CR-168401; NAS 1.26:168401; INPE-2191-RPE/003) Avail: NTIS HC A03/MF A01 CSCL 05B

The LANDSAT system, operated in the country by CNPq/INPE since 1973, systematically acquires, produces, and distributes both multispectral and panchromatic images obtained through remote sensing satellites to thousands of researchers and technicians involved in the natural resources survey. To cooperate in the solution of national problems, CNPq/INPE is

developing efforts in the area of manipulation of those images with the objective of making them useful as planimetric bases for the simple revision of already published maps or for its utilization as basic material in regions not yet reliability mapped. The results obtained from performed tests are presented and the existing limitations are discussed. The new system purchased to handle data from the next series of LANDSAT as well as from MAPSAT and SPOT which will be in operation within the 80's decade, and are designed not only for natural resources survey but also for the solution of cartographic problems. Author

N82-20604*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

AN ALGORITHM FOR SPATIAL HEIRARCHY CLUSTERING [UM ALGORITMO PARA AGREGACAO HIERARQUICA ESPACIAL]

Nelson deJesusParada. Principal Investigator and Flavio Roberto Dias Velasco Jul. 1981 12 p refs In PORTUGUESE; ENGLISH summary ERTS

(E82-10081; NASA-CR-168402; NAS 1.26:168402; INPE-2170-RPE/386) Avail: NTIS HC A02/MF A01 CSCL 05B

A method for utilizing both spectral and spatial redundancy in compacting and preclassifying images is presented. In multispectral satellite images, a high correlation exists between neighboring image points which tend to occupy dense and restricted regions of the feature space. The image is divided into windows of the same size where the clustering is made. The classes obtained in several neighboring windows are clustered, and then again successively clustered until only one region corresponding to the whole image is obtained. By employing this algorithm only a few points are considered in each clustering, thus reducing computational effort. The method is illustrated as applied to LANDSAT images. J.D.H.

N82-20605*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

DYNAMIC STUDY OF THE UPPER SAO FRANCISCO RIVER AND THE TRES MARIAS RESERVOIR USING MSS/LANDSAT IMAGES [ESTUDO DINAMICO DO ALTO RICO SAO FRANCISCO ERESERVATORIO DETRES MARIAS, ATRAVES DE IMAGENS MSS/LANDSAT]

Nelson deJesusParada, Principal Investigator and Tania Maria Sausen Jul. 1981 77 p refs In PORTUGUESE Presented at 33rd Reuniao Anual da SBPC, Salvador, Brazil, 8-15 Jun. 1981 Sponsored by NASA ERTS

(E82-10082; NASA-CR-168403; NAS 1.26:168403; INPE-2154-RPE/373) Avail: NTIS HC A05/MF A01 CSCL 08H

The use of LANDSAT multispectral ban scanner imagery to verify the relationship between the behavior of the Tres Marias reservoir and the dynamics of the Sao Francisco River supply basin is described. The dispersion of suspended sediments and their concentration in the surface layers of the water are considered. A five year survey of the region during both dry and rainy seasons was performed. The drainage network was analyzed based on the patterns of dessication, water rises and soil use in the supply basin. Surface layers of the reservoir were tabulated as a function of the levels of gray in the imagery. In situ observations of water depth and reflectance were performed. Ground truth and LANDSAT data were correlated to determine the factors affecting the dynamics of the supply basin. J.D.H.

N82-20606*# National Aeronautics and Space Administration, Washington, D. C.

GRADIO: PROJECT PROPOSAL FOR SATELLITE GRADIOMETRY

G. Balmino, F. Barlier, A. Bernard, C. Bouzat, G. Riviera, and J. Runavot Dec. 1981 55 p refs Transl. into ENGLISH of "Gradio: Gradiometrie par Satellite Proposition de Projet" Rept. no. 244 PRT/AMP/AP (France), 8 Sep. 1981 p 1-51 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prep. by Centre National Etudes Spatiales

(Contract NASw-3541)

(NASA-TM-76796; NAS 1.15:76796) Avail: NTIS HC A04/MF A01 CSCL 08B

A gradiometric approach, rather than the more complicated satellite to satellite tracking, is proposed for studying anomalies in the gravitational fields of the Earth and, possibly, other telluric bodies. The first analyses of a gradiometer based on four of ONERA's CACTUS or SUPERCACTUS accelerometers are summarized. it is shown that the obstacles to achieving the required accuracy are not insuperable. The device will be carried in a 1000 kg lens shaped satellite in a heliosynchronous orbit 200 to 300 km in altitude. The first launching is planned for the end of 1987. Author

N82-20607*# Florida Univ., Gainesville. Climatology Lab.

APPLICATION OF SATELLITE FROST FORECAST TECHNOLOGY TO OTHER PARTS OF THE UNITED STATES, PHASE 2 Final Report

J. David Martsolf, Ellen Chen, C. Terry Morrow, Stuart H. Gage, and Jon F. Bartholic Nov. 1981 265 p refs Prepared in cooperation with Pennsylvania State Univ., University Park and Michigan State Univ., East Lansing Original contains color illustrations

(Contract NAS10-9876)

(NASA-CR-166827) Avail: NTIS HC A12/MF A01 CSCL 02C

Thermal infrared data taken from the GOES satellite over a period of several hours was color enhanced by computer according to temperature. The varying temperatures were then used to assist in frost forecasting. Input from Michigan and Pennsylvania to the cold climate mapping project is emphasized in the report of the second year's activities of a two-year effort. For individual titles, see N82-20608 through N82-20615.

N82-20608*# Florida Univ., Gainesville.

APPLICATION OF SATELLITE FROST FORECAST TECHNOLOGY TO OTHER PARTS OF THE UNITED STATES, PHASE 2, INTRODUCTION Final Report

In its Appl. of Satellite Frost Forecast Technol. to Other Parts of the U.S., Phase 2 Nov. 1981 31 p (For primary document see N82-20607 11-43)

Avail: NTIS HC A12/MF A01 CSCL 02C

The history and status of University of Michigan and University of Pennsylvania involvement in determining if P-model for frost prediction used in Florida is applicable to those geographic locations is reviewed. The possibility of using the S-model to develop a satellite frost forecast system that can recall the distribution of temperatures during previous freezes from a particular area and bring that cold climate climatology to bear on present forecasts is discussed as well as a proposed GOES satellite downlink system to sectionalize the data used in Florida. A.R.H.

N82-20609*# Pennsylvania State Univ., University Park. Dept. of Agricultural Engineering.

[FREEZE PREDICTION MODEL] Final Report

C. Terry Morrow *In* Florida Univ. Appl. of Satellite Frost Forecast Technol. to Other Parts of the U.S., Phase 2 Nov. 1981 25 p refs (For primary document see N82-20607 11-43)

Avail: NTIS HC A12/MF A01 CSCL 02C

Measurements of wind speed, net irradiation, and of air, soil, and dew point temperatures in an orchard at the Rock Springs Agricultural Research Center, as well as topographical and climatological data and a description of the major apple growing regions of Pennsylvania were supplied to the University of Florida for use in running the P-model, freeze prediction program. Results show that the P-model appears to have considerable applicability to conditions in Pennsylvania. Even though modifications may have to be made for use in the fruit growing regions, there are advantages for fruit growers with the model in its present form. A.R.H.

N82-20610*# Pennsylvania Crop Reporting Service, Harrisburg.

PENNSYLVANIA ORCHARD AND VINEYARD INVENTORY SURVEY, 1978 Final Report

Wallace C. Evans, comp. and P. Gregory Truckor, comp. *In* Florida Univ. Appl. of Satellite Frost Forecast Technol. to Other Parts of the U.S., Phase 2 Nov. 1981 67 p refs Sponsored in part by the Pennsylvania Dept. of Agriculture and the U.S. Department of Agriculture (For primary document see N82-20607 11-43)

Avail: NTIS HC A12/MF A01 CSCL 02C

Significant developments in the fruit industry in Pennsylvania

are reported to provide basic information as a guide in the production and marketing of apples, pears, cherries, peaches, grapes, plums, prunes and nectarines. Tables show the number of growers, trees and acres by kind of fruit as well as the age of the trees, the number of barrels produced, and production by county and region. A.R.H.

N82-20611*# National Oceanic and Atmospheric Administration, Asheville, N. C. National Climatic Center.
CLIMATE OF PENNSYLVANIA Final Report
In Florida Univ. Appl. of Satellite Frost Forecast Technol. to Other Parts of the U.S., Phase 2 Nov. 1981 23 p (For primary document see N82-20607 11-43)
Avail: NTIS HC A12/MF A01 CSCL 02C

Some of the principal climatic features of Pennsylvania are described and a number of climatological summaries are presented for stations in various geographic regions of Pennsylvania A.R.H.

N82-20612*# Pennsylvania State Univ., University Park.
THE OFFICE FOR REMOTE SENSING OF EARTH RESOURCES Final Report
In Florida Univ. Appl. of Satellite Frost Forecast Technol. to Other Parts of the U.S., Phase 2 Nov. 1981 6 p refs (For primary document see N82-20607 11-43)
Avail: NTIS HC A12/MF A01 CSCL 05B

The main effort of the University of Pennsylvania's office for remote sensing of Earth resources (ORSER) is the processing, analysis, and interpretation of multispectral data, most often supplied by NASA in the form of imagery and digital data. The facilities used for data reduction and image enhancement are described as well as the development of algorithms for producing a computer map showing various environmental and land use characteristics of data points in the analyzed scenes. The application of an (ORSER) capability for statewide monitoring of gypsy moth defoliation is discussed. A.R.H.

N82-20613*# Michigan State Univ., East Lansing. Dept. of Entomology.
APPLICABILITY OF SATELLITE FREEZE FORECASTING AND COLD CLIMATE MAPPING TO THE OTHER PARTS OF THE UNITED STATES Final Report
In Florida Univ. Appl. of Satellite Frost Forecast Technol. to Other Parts of the U.S., Phase 2 Nov. 1981 59 p refs Original contains color illustrations (For primary document see N82-20607 11-43)
Avail: NTIS HC A12/MF A01 CSCL 04B

Tasks performed to determine the value of using GOES satellite thermal imagery to enhance fruit crop production in Michigan are described. An overview is presented of the system developed for image processing and thermal image and surface environmental data bases prepared to assess the physical models developed in Florida. These data bases were used to identify correlations between satellite apparent temperatures patterns and Earth surface factors. Significant freeze events in 1981 and the physical models used to provide a perspective on how Florida models can be applied in the context of the Michigan environment are discussed. A.R.H.

N82-20614*# Michigan State Univ., East Lansing.
MSU TEST OF P-MODEL Final Report
In Florida Univ. Appl. of Satellite Frost Forecast Technol. to Other Parts of the U.S., Phase 2 Nov. 1981 8 p refs (For primary document see N82-20607 11-43)
Avail: NTIS HC A12/MF A01 CSCL 05B

Results of running key station data (soil, air, and dew point temperatures, net irradiation, and wind direction and speed) from Michigan through the P-model are presented. The details of each of the 55 error calculations are shown in tables. A histogram is included showing errors in degrees Fahrenheit. A.R.H.

N82-20615*# Florida Univ., Gainesville. Dept. of Fruit Crops.
A SATELLITE FROST FORECASTING SYSTEM FOR FLORIDA Final Report
J. David Martsolf *In its* Appl. of Satellite Frost Forecast Technol. to Other Parts of the U.S., Phase 2 Nov. 1981 42 p refs Presented at the Workshop on Appl. of Weather Data to Agr. and Forest Prod., Anaheim, Calif., 30-31 Mar. 1981; sponsored by American Meteorological Soc. and NSF (For primary document see N82-20607 11-43)
Avail: NTIS HC A12/MF A01 CSCL 04B

Since the first of two minicomputers that are the main components of the satellite frost forecast system was delivered in 1977, the system has evolved appreciably. A geostationary operational environmental satellite (GEOS) system provides the satellite data. The freeze of January 12-14, 1981, was documented with increasing interest in potential of such systems. Satellite data is now acquired digitally rather than by redigitizing the GOES-Tap transmissions. Data acquisition is now automated, i.e., the computers are programmed to operate the system with little, if any, operator intervention. A.R.H.

N82-20616# Committee on Energy and Natural Resources (U.S. Senate).
PROPOSED 5-YEAR PLAN OIL AND GAS DEVELOPMENT IN THE OUTER CONTINENTAL SHELF
Washington GPO 1981 170 p refs Hearing before the Subcomm. on Energy Conservation and Supply of the Comm. on Energy and Natural Resources, 97th Congr., 1st Sess., 6 Oct. 1981
(Publ-97-43; GPO-86-955) Avail: Subcomm. on Energy Conservation and Supply

A proposed 5-year plan for offshore oil and gas exploration and development is discussed. The program calls for 42 lease sales covering nearly 1 billion acres. Whether the proposed lease sales could be detrimental to the protection of environmentally sensitive areas and fishing ground is discussed. Oil spills and transport problems are investigated. R.J.F.

N82-20617*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATIONS SYSTEMS VERIFICATION AND TRANSFER PROJECT. VOLUME 1: OPERATIONAL APPLICATIONS OF SATELLITE SNOW COVER OBSERVATIONS: EXECUTIVE SUMMARY
Albert Rango Dec. 1981 81 p refs 8 Vol.
(NASA-TP-1822; NAS 1.60:1822; Rept-81F0060-Vol-1) Avail: NTIS HC A05/MF A01 CSCL 05B

Both LANDSAT and NOAA satellite data were used in improving snowmelt runoff forecasts. When the satellite snow cover data were tested in both empirical seasonal runoff estimation and short term modeling approaches, a definite potential for reducing forecast error was evident. A cost benefit analysis run in conjunction with the snow mapping indicated a $36.5 million annual benefit accruing from a one percent improvement in forecast accuracy using the snow cover data for the western United States. The annual cost of employing the system would be $505,000. The snow mapping has proven that satellite snow cover data can be used to reduce snowmelt runoff forecast error in a cost effective manner once all operational satellite data are available within 72 hours after acquisition. Executive summaries of the individual snow mapping projects are presented. J.M.S.

N82-20618*# Geological Survey, Phoenix, Ariz.
APPLICATIONS SYSTEMS VERIFICATION AND TRANSFER PROJECT. VOLUME 2: OPERATIONAL APPLICATIONS OF SATELLITE SNOW-COVER OBSERVATIONS AND DATA-COLLECTION SYSTEMS IN THE ARIZONA TEST SITE
Herbert H. Schumann Dec. 1981 62 p refs 8 Vol.
(NASA-TP-1823; NAS 1.60:1823; Rept-81F0061-Vol-2) Avail: NTIS HC A04/MF A01 CSCL 08L

Ground surveys and aerial observations were used to monitor rapidly changing moisture conditions in the Salt-Verde watershed. Repetitive satellite snow cover observations greatly reduce the necessity for routine aerial snow reconnaissance flights over the mountains. High resolution, multispectral imagery provided by LANDSAT satellite series enabled rapid and accurate mapping of snow-cover distributions for small- to medium-sized subwatersheds; however, the imagery provided only one observation every 9 days of about a third of the watershed. Low resolution imagery acquired by the ITOSa dn SMS/GOES meteorological satellite series provides the daily synoptic observation necessary to monitor the rapid changes in snow-covered area in the entire watershed. Short term runoff volumes can be predicted from daily sequential snow cover observations. J.M.S.

N82-20619*# California State Dept. of Water Resources, Sacramento.
APPLICATIONS SYSTEMS VERIFICATION AND TRANSFER PROJECT. VOLUME 3: OPERATIONAL APPLICATIONS OF SATELLITE SNOW COVER OBSERVATIONS IN CALIFORNIA
A. J Brown and J. F. Hannaford (Sierra Hydrotech, Placerville, Calif.) Dec. 1981 70 p refs 8 Vol.
(Contract NAS5-20831)
(NASA-TP-1824; NAS 1.60:1824; Rept-81F0062-Vol-3) Avail: NTIS HC A04/MF A01 CSCL 08L

Five southern Sierra snowmelt basins and two northern Sierra-Southern Cascade snowmelt basins were used to evaluate the effect on operational water supply forecasting from satellite imagery. Manual photointerpretation techniques were used to obtain SCA and equivalent snow line for the years 1973 to 1979 for the seven test basins using LANDSAT imagery and GOES imagery. The use of SCA was tested operationally in 1977-79. Results indicate the addition of SCA improve the water supply forecasts during the snowmelt phase for these basins where there may be an unusual distribution of snowpack throughout the basin, or where there is a limited amount of real time data available. A high correlation to runoff was obtained when SCA was combined with snow water content data obtained from reporting snow sensors. T.M.

N82-20620*# Soil Conservation Service, Denver, Colo.
APPLICATIONS SYSTEMS VERIFICATION AND TRANSFER PROJECT. VOLUME 4: OPERATIONAL APPLICATIONS OF SATELLITE SNOW COVER OBSERVATIONS, COLORADO FIELD TEST CENTER
Bernard A. Shafer, Charles F. Leaf, Jeris A. Danielson (Colorado State Engineers Office), and George F. Moravec (Colorado State Engineers Office) Dec. 1981 101 p refs 8 Vol.
(NASA-TP-1825; NAS 1.60:1825; Rept-81F0063-Vol-4) Avail: NTIS HC A06/MF A01 CSCL 08L

The study was conducted on six watersheds ranging in size from 277 km to 3460 km in the Rio Grande and Arkansas River basins of southwestern Colorado. Six years of satellite data in the period 1973-78 were analyzed and snowcover maps prepared for all available image dates. Seven snowmapping techniques were explored; the photointerpretative method was selected as the most accurate. Three schemes to forecast snowmelt runoff employing satellite snowcover observations were investigated. They included a conceptual hydrologic model, a statistical model, and a graphical method. A reduction of 10% in the current average forecast error is estimated when snowcover data in snowmelt runoff forecasting is shown to be extremely promising. Inability to obtain repetitive coverage due to the 18 day cycle of LANDSAT, the occurrence of cloud cover and slow image delivery are obstacles to the immediate implementation of satellite derived snowcover in operational streamflow forecasting programs. T.M.

N82-20621*# Bonneville Power Administration, Portland, Oreg.
APPLICATIONS SYSTEMS VERIFICATION AND TRANSFER PROJECT. VOLUME 5: OPERATIONAL APPLICATIONS OF SATELLITE SNOW-COVER OBSERVATIONS, NORTHWEST UNITED STATES
John P. Dillard Dec. 1981 84 p refs 8 Vol.
(Contract NASA Order S-53877)
(NASA-TP-1826; NAS 1.60:1826; Rept-81F0064-Vol-5) Avail: NTIS HC A05/MF A01 CSCL 08L

The study objective was to develop or modify methods in an operational framework that would allow incorporation of satellite derived snow cover observations for prediction of snowmelt derived runoff. Data were reviewed and verified for five basins in the Pacific Northwest. The data were analyzed for up to a 6-year period ending July 1978, and in all cases cover a low, average, and high snow cover/runoff year. Cloud cover is a major problem in these springtime runoff analyses and have hampered data collection for periods of up to 52 days. Tree cover and terrain are sufficiently dense and rugged to have caused problems. The interpretation of snowlines from satellite data was compared with conventional ground truth data and tested in operational streamflow forecasting models. When the satellite snow-covered area (SCA) data are incorporated in the SSARR (Streamflow Synthesis and Reservoir Regulation) model, there is a definite but minor improvement. T.M.

N82-20622*# National Environmental Satellite Service, Washington, D. C.
APPLICATIONS SYSTEMS VERIFICATION AND TRANSFER PROJECT. VOLUME 6: OPERATIONAL APPLICATIONS OF SATELLITE SNOW-COVER OBSERVATIONS NOAA/NESS SUPPORT STUDY Final Report, 1 Jan. 1975 - 31 Dec. 1978
Stanley R. Schneider Dec. 1981 68 p refs 8 Vol.
(NASA Order S-53772)
(NASA-TP-1827; NAS 1.60:1827; Rept-81F0065-Vol-6) Avail: NTIS HC A04/MF A01 CSCL 05B

Geostationary and polar orbiting satellite data from the National Oceanic and Atmospheric Administration were used to operationally provide field hydrologists with basin snowcover percentages for inclusion in runoff models. Data reduction is accomplished thru the use of optical rectification devices and electronic color density slicers. Over two thousand satellite-derived snow maps covering 30 different basins in the western United States were provided to users. Plans for improving snowmapping techniques on computer interactive systems and by all-digital analysis are presented. A description of the newest generation of NOAA polar orbiters, TIROS-N, and its potential for snowmapping is reviewed. Snowcover percentages for all basins determined between November 1974 and July 1978 are presented in tabular format. J.M.S.

N82-20623*# Ecosystems International, Inc., Gambrills, Md.
APPLICATIONS SYSTEMS VERIFICATION AND TRANSFER PROJECT. VOLUME 7: COST/BENEFIT ANALYSIS FOR THE ASVT ON OPERATIONAL APPLICATIONS OF SATELLITE SNOW-COVER OBSERVATIONS
P. Castruccio, H. Loats, D. Lloyd, and P. Newman Dec. 1981 245 p refs 8 Vol.
(Contract NAS5-23729)
(NASA-TP-1828; NAS 1.60:1818; Rept-81F0066-Vol-7) Avail: NTIS HC A11/MF A01 CSCL 08L

The results of the OASSO ASVT's were used to estimate the benefits accruing from the added information available from satellite snowcover area measurement. Estimates of the improvement in runoff prediction due to addition of SATSCAM were made by the Colorado ASVT personnel. The improvement estimate is 6-10%. Data were applied to subregions covering the Western States snow area amended by information from the ASVT and other watershed experts to exclude areas which are not impacted by snowmelt runoff. Benefit models were developed for irrigation and hydroenergy uses. The benefit/cost ratio is 72:1. Since only two major benefit contributors were used and since the forecast improvement estimate does not take into account future satellite capabilities these estimates are considered to be conservative. The large magnitude of the benefit/cost ratio supports the utility and applicability of SATSCAM. T.M.

N82-20624*# Environmental Research and Technology, Inc., Concord, Mass.
APPLICATIONS SYSTEMS VERIFICATION AND TRANSFER PROJECT. VOLUME 8: SATELLITE SNOW MAPPING AND RUNOFF PREDICTION HANDBOOK
Clinton J. Bowley, James C. Barnes, and Albert Rango (NASA Goddard Space Flight Center) Dec. 1981 98 p refs 8 Vol.
(Contract NAS5-24410)
(NASA-TP-1829; NAS 1.60:1829; Rept-81F0067-Vol-8) Avail: NTIS HC A05/MF A01 CSCL 08L

The purpose of the handbook is to update the various snowcover interpretation techniques, document the snow mapping techniques used in the various ASVT study areas, and describe the ways snowcover data have been applied to runoff prediction. Through documentation in handbook form, the methodology developed in the Snow Mapping ASVT can be applied to other areas. T.M.

N82-20625# Army Engineer Topographic Labs., Fort Belvoir, Va.
EVALUATION OF THE POSITION AND AZIMUTH DETERMINING SYSTEM'S POTENTIAL FOR HIGHER ACCURACY SURVEY

Thomas O. Tindall 20 Mar. 1982 14 p refs
(AD-A109006; ETL-R029) Avail: NTIS HC A02/MF A01 CSCL 19/5

Tests were conducted to evaluate the accuracy potential of the U.S. Army Field Artillery's inertial survey system (Position and Azimuth Determining System AN/USQ-70). The test results reported include position, height and gravity anomaly. Also discussed is a post-mission least squares adjustement technique which was applied to the test results and which should have application to other inertial survey system missions. Author

N82-20626# Inter-American Geodetic Survey, Fort Sam Houston, Tex.
REMOTE SENSING IN LATIN AMERICA: TECHNOLOGY AND MARKETS FOR THE 1980'S
Lawrence J. Jungman Aug. 1981 16 p refs
(AD-A108784) Avail: NTIS HC A02/MF A01 CSCL 22/2

A review is made on the impact of satellite derived remote sensing data in Latin America. Data availability has generated a phenomenal growth in the user community in Latin America, and new sensor systems planned and proposed are viewed as a further impetus to an increased market in the Americas. The international institutionalization of remote sensing interests in the area is an indicator submitted as a viable force in the continued, future market and transfer of technology. The availability of required training and funding for special projects by these institutions is reviewed. Proposals are made for special training to prepare for increased digital and cartographic applications that will be required in the expanded users market of the 1980s. GRA

N82-20627# Army Engineer Topographic Labs., Fort Belvoir, Va.
ERROR STATISTICS FOR ASTROGEODETIC POSITIONS FOR AN RGSS TEST COURSE
Angel A. Baldini Jul. 1981 50 p
(DA Proj. 4A1-61101-A-91-D)
(AD-A109144; ETL-0267) Avail: NTIS HC A03/MF A01 CSCL 08/5

In the experimental mobile inertial survey system, geodetic parameters are measured relative to an origin point. Certain errors build up along the survey course. Typically, these errors are adjusted and distributed both during and after completing each mission. During testing, the adjusted derived data are compared with 'known' data that are determined by conventional 'classical' surveys. In its research, ETL requires a more accurate adjustment of errors obtained from conventional methods. The approach to the problem involved evaluating and analyzing the various error sources in the conventional data recalculation of certain data by new methods and developing a new statistical error treatment that applies not only to the objectives of this in-house research, but to the general application of inertial geodetic systems. In this report, a new statistical error procedure has been developed to improve geodetic positions that are useful in ETL's core program of RGSS tests and in any future tests of inertial systems.
Author (GRA)

N82-20628# Army Engineer Topographic Labs., Fort Belvoir, Va.
COMPUTER-ASSISTED PHOTO INTERPRETATION RESEARCH AT USAETL
George E. Lukes 21 Apr. 1981 14 p refs
(AD-A109366; ETL-R028) Avail: NTIS HC A02/MF A01 CSCL 08/5

A program in computer-assisted photo interpretation research (CAPIR) has been initiated at the U.S. Army Engineer Topographic Laboratories. In a new laboratory, a photo interpreter (PI) analyzing high-resolution, aerial photography interfaces directly to a digital computer and geographic information system (GIS). A modified analytical plotter enables the PI to transmit encoded three dimensional spatial data from the stereomodel to the computer. Computer-generated graphics are displayed in the stereomodel for direct feedback of digital spatial data to the PI. Initial CAPIR capabilities include point positioning, mensuration, stereoscopic area search, GIS creation and playback, and elevation data extraction. New capabilities under development include stereographic superposition, a digital image workstation, and integration of panoramic Optical Bar Camera photography as a primary GIS data source. This project has been conceived as an evolutionary approach to the digital cartographic feature extraction problem. As a working feature extraction system, the CAPIR laboratory can serve as a testbed for new concepts emerging from image understanding and knowledge-based systems research. GRA

N82-20629# San Diego Natural History Museum, Calif.
WATER-COLUMN STUDIES NEAR A MELTING ARCTIC ICEBERG
Eric Shulenberger Dec. 1981 41 p refs
(Contract N00014-78-C-0679)
(AD-A108304) Avail: NTIS HC A03/MF A01 CSCL 08/12

Glacial icebergs contain large amounts of nitrate, an important phytoplankton nutrient. Low density iceberg meltwater, in rising, mixes with euphotic zone water nearby, wherein NO3 is in low concentration. Rising meltwater may also entrain nutrient-rich deeper waters and raise them to sunlit depths. Sixteen vertical profiles of nutrients (PO4, NO3, SiO2), chlorophyll-a, and physical parameters were taken near a Greenland iceberg at approx. 50 deg. N, 50 deg. W in May-June 1980. Chlorophyll profiles show very pronounced maxima at or just below the maximum rate of change of water density vs. depth; profile forms are heterogeneous (no 'typical' form is evident). No enhancement of chlorophyll concentration was found re distance from or direction to the iceberg. Effects of mixing on NO 3 concentrations are marginally detectable, but no 'wake' or 'downwind' effects were observed. The iceberg does not appear to grossly perturb water column olant biology nearby, but measures of rates of productivity might show otherwise, particularly near larger (e.g. Antarctic) icebergs. Author (GRA)

N82-20630# Naval Ocean Systems Center, San Diego, Calif.
SATELLITE-BORNE NON-DOD SENSORS FOR TERRESTRIAL OBSERVATIONS
H. M. Wight Aug. 1981 66 p refs
(AD-A109486; NOSC/TD-458) Avail: NTIS HC A04/MF A01 CSCL 22/2

This is a summary review that was made of satellite-borne 'non-DoD sensors' used for terrestrial observations. The term non-DoD sensors refers to 'civil' (as contrasted with 'military') remote sensing systems. The civil satellite-borne sensing systems were developed for the most part by NASA and are employed operationally by NOAA/NESS. Author (GRA)

N82-20631# Army Construction Engineering Research Lab., Champaign, Ill.
ESTABLISHING PRIORITIES FOR ACQUIRING NATURAL RESOURCES DATA PARAMETERS Final Report
W. D. Severinghaus, R. G. Goettel, and L. L. Radke Nov. 1981 198 p refs
(AD-A109720; CERL-TR-N-121) Avail: NTIS HC A09/MF A01 CSCL 05/1

This report explains procedures allowing personnel who manage natural resources at Army installations to gather and disseminate environmental data efficiently. The report defines data parameters required for natural resources management in the areas of fish and wildlife; forestry; agricultural outleases; outdoor recreation; training; and buildings and grounds. Techiques are described for ranking parameters on the basis of the duration of usefulness of a piece of information, the need to have the information, and the availability of the information. These procedures will indicate to the natural resources manager: the data that he/she needs to collect; the importance others attach to this information; and the order in which the information should be acquired. Author (GRA)

N82-20632# Management Engineers, Inc., Reston, Va.
ROOM AND PILLAR RETREAT MINING: A MANUAL FOR THE COAL INDUSTRY
Peter W. Kauffman, Steven A. Hawkins, and Robert R. Thompson Aug. 1981 240 p refs
(PB82-120601; BM-IC-8849) Avail: NTIS HC A11/MF A01 CSCL 08I

This Bureau of Mines publication is designed primarily to provide mine engineers and production-level mine managers with the following: (1) information to assist them in making the decision

to retreat mine and in selecting the best retreat mining technique for specific mining conditions; (2) information on mine planning that will enable them to design mine layouts for safe and efficient retreat mining (3) information that will enable them to develop a section foreman's handbook. The manual progressively increases in level of detail. GRA

N82-20633# Delft Hydraulics Lab. (Netherlands).
BIOGEOCHEMICAL AND HYDRODYNAMIC PROCESSES AFFECTING HEAVY METALS IN RIVERS, LAKES AND ESTUARIES
W. Salomons, W. G. Mook, and W. Eysink Feb. 1981 75 p refs
(PB82-121278; Pub-253) Avail: NTIS HC A04/MF A01 CSCL 08H

Pathways of mud and particulate trace metals from rivers to the southern North Sea are discussed. Other topics trace metal concentrations in estuarine sediments; mobilization, mixing or precipitation; adsorption processes and hydrodynamic conditions in estuaries; and biogeochemical processes affecting metal concentrations in lake sediments. GRA

N82-20634# Comsul Ltd., San Francisco, Calif.
THE IMPLEMENTATION OF UHF RADIO COMMUNICATIONS AND CCTV MONITORING SYSTEMS IN A ROOM AND PILLAR METAL/NON-METAL MINE Final Open File Report, Oct. 1977 - Mar. 1981
R. A. Isberg, H. Kramer, and D. A. Parrish Mar. 1981 133 p refs
(Contract DI-BM-J0-377044)
(PB82-116674; BM-OFR-131-81) Avail: NTIS HC A07/MF A01 CSCL 08I

The design and implementation of radio and closed-circuit television systems in the Black River room-and-pillar limestone mine near Butler, Pendleton County, KY are discussed. Signal attenuation on 812 and 466 mHz was measured in the slope tunnel and in the straight and level crosscuts in the mine. Two distributed antenna systems fed by two sets of base stations provide approximately 75 pct coverage of the mine. Passive reflectors were used for extending signals into intersecting crosscuts and two-way signal boosters will be used to extend signals to the perimeter and obstructed areas of the mine. Fourteen mine vehicles were equipped with mobile radios with digital identification, alarm, and status encoders. Fifteen portable transceivers also were used. Six closed-circuit television cameras provide surveillance of critical transfer points of the belt conveyor system, the loading dock at the base of the slope, and an ash disposal area in the mine. Two-way radio communication and closed-circuit television saved considerable work hours, increased production, reduced maintenance costs, and enhanced safety. GRA

N82-20635# Arctec, Inc., Columbia, Md.
ASSESSMENT OF ICE CONDITIONS IN THE SOUTH BERING SEA BASED ON APRIL 1980 USCG POLAR CLASS TRAFFICABILITY TEST DATA. EXECUTIVE SUMMARY
R. P. Voelker, F. W. DeBord, J. J. Nelka, J. W. Jacobi, and J. L. Coburn 31 Jan. 1981 12 p refs 3 Vol.
(Contract MA79-SAC-00035)
(PB82-118431; Rept-500C-2-ES; MA-RD-920-80093) Avail: NTIS HC A02/MF A01; also available in set of 3 reports HC E19 as PB82-118423 CSCL 08L

Environmental and ship performance data were collected in April 1980 as part of a multiyear program to make an operational assessment of the feasibility of a year round transportation system serving northwestern Alaska. Seasonal year operation data are summarized and recommendations for future trafficability tests are made. GRA

N82-20636# Arctec, Inc., Columbia, Md.
ASSESSMENT OF ICE CONDITIONS IN THE SOUTH BERING SEA BASED ON APRIL 1980 USCG POLAR CLASS TRAFFICABILITY TEST DATA, VOLUME 1
R. P. Voelker, F. W. DeBord, J. W. Nelka, J. W. Jacobi, and J. L. Coburn 31 Jan. 1981 37 p refs 3 Vol.
(Contract MA79-SAC-00035)
(PB82-118449; Rept-500C-2-Vol-1; MA-RD-920-80094) Avail: NTIS HC A03/MF A01; also available in set of 3 reports HC E11 as PB82-118423 CSCL 08L

Program objectives, planned deployment, and the data collection program for year round transportation system serving northwestern Alaska are described. A description of all data collected and the subsequent analysis is given for level ice and the 40 profiled pressure ridges. Underwater photographs were successfully taken of pressure ridge keels and the coefficient of friction between the ship's hull and ice were measured. GRA

N82-20637# Arctec, Inc., Columbia, Md.
ASSESSMENT OF ICE CONDITIONS IN THE SOUTH BERING SEA BASED ON APRIL 1980 USCG POLAR CLASS TRAFFICABILITY TEST DATA, VOLUME 2
R. P. Voelker, F. W. DeBord, J. J. Nelka, J. W. Jacobi, and J. L. Coburn 31 Jan. 1981 133 p refs 3 Vol.
(Contract MA79-SAC-00035)
(PB82-118456; Rept-500C-2-Vol-2; MA-RD-920-80095) Avail: NTIS HC A07/MF A01; also available in set of 3 reports HC E11 as PB82-118423 CSCL 08L

Environmental and ship performance data were collected aboard the USCGC POLAR STAR in April 1980 as part of a multi-year program to make an operational assessment of the feasibility of a year-round transportation system serving northwestern Alaska. Ice can be dubious in the south bering sea were assessed. Polar class trafficability test data are reported. The appendices to the report are presented including data summaries, calculations, thickness measurements, and standard sea-ice nomenclature. GRA

N82-20580# Bayerische Akademie der Wissenschaften, Munich (West Germany).
SOME CRITERIA FOR THE ACCURACY AND THE RELIABILITY OF NETWORKS
Hans Pelzer *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union of Geodesy and Geophys. 1980 p 55-67 refs (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

N82-20581# Bayerische Akademie der Wissenschaften, Munich (West Germany).
EXPERIMENTS IN SATELLITE DOPPLER CONTROL POSITIONING AT SEA
Guenter Seeber, Delf Egge, and Hans Werner Schenke *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union of Geodesy and Geophys. 1980 p 69-80 refs Sponsored by Bundesministerium fuer Forschung- und Technologie and Deutsche Forschungsgeimschaft (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

N82-20583# Bayerische Akademie der Wissenschaften, Munich (West Germany).
RECENT RESULTS OF GEOID DETERMINATION BY COMBINATION TECHNIQUES IN THE NORTH SEA TEST AREA
Hans-Georg Wenzel *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union of Geodesy and Geophys. 1980 p 95-121 refs Sponsored by Deutsche Forschungsgeimschaft (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N82-20638 Virginia Polytechnic Inst. and State Univ., Blacksburg.
STAGNATION TEMPERATURE TEST METHODS FOR

DETERMINING SOLAR COLLECTOR THERMAL PERFORMANCE DEGRADATION Ph.D. Thesis
Aaron Grayson Dawson, III 1981 156 p
Avail: Univ. Microfilms Order No. 8126252

An analytical and experimental investigation was undertaken to evaluate a proposed method for determining the thermal degradation of materials used in flat-plate solar collectors. The proposed method is based on measuring stagnation (no-flow) temperatures of the absorber plate. A comparison of the advantages and limitations of the proposed method is made with the conventionally used existing method which is based on measuring the energy output from the collector. Previous investigations show that the existing test method may not be sufficiently sensitive to detect expected changes in material properties, is influenced by the test environment, and is relatively expensive to perform. The material properties of interest are primarily the cover transmittance, the solar absorptance of the absorber, the infrared emittance of the absorber, and the thermal conductivity of insulation. Dissert. Abstr.

N82-20639 Virginia Polytechnic Inst. and State Univ., Blacksburg.
ANALYTICAL AND EXPERIMENTAL ANALYSIS OF PROCEDURES FOR TESTING SOLAR DOMESTIC HOT WATER SYSTEMS Ph.D. Thesis
Arthur Hunter Fanney, II 1981 181 p
Avail: Univ. Microfilms Order No. 8126255

Three experimental techniques which allow the net thermal output of an irradiated solar collector array, without the use of a solar simulator, to be reproduced indoors are investigated. These techniques include use of an electric heat source only, use of a nonirradiated collector array in series with an electric heat source, and the use of electric strip heaters which are attached to the back of nonirradiated absorber plates. Expressions are developed to compute the input power required for each experimental technique. Solar collectors connected in parallel and series combinations are considered. Experiments conducted to determine the effect of storage tank, temperature stratification on system performance for a single tank direct solar hot water system are described. Dissert. Abstr.

N82-20640 Clemson Univ., S.C.
SECOND QUADRANT EFFECTS IN SILICON SOLAR CELLS Ph.D. Thesis
Robert Arnold Hartman 1981 129 p
Avail: Univ. Microfilms Order No. 8126922

The effects observed when a silicon solar cell operates in the second quadrant of its VI characteristic is described. Even while the cause can be temporary, its effect can be destructive to a module. A computer model, based on the thermal and electrical properties of the cells and encapsulating materials, was developed to relate cell temperature to electrical characteristics in the second quadrant. This model adequately predicted the behavior of both encapsulated and unencapsulated cells, although accurate temperature measurements on encapsulated cells were difficult to obtain. In addition, only cells of one type were used for comparison and other cell types may require different parameter values for fitting. Use of the model should permit the prediction of a cell's sensitivity to degradation in the second quadrant. The computer program is listed together with a description of its operation. Furthermore, a new solar cell design with an integrated diode is described. Dissert. Abstr.

N82-20641 British Library Lending Div., Boston Spa (England).
HEAT EXTRACTION FROM TWO TUBE PLANES AND ROOF ABSORBER. OPERATING EXPERIENCE WITH A MONOVALENT EARTH HEAT PUMP INSTALLATION WITH A SMALL AREA OF EARTH FOR HEAT EXTRACTION
D. Ruhm 14 Jan. 1982 12 p refs Transl. into ENGLISH from Sanitaer und Heizungstech. (West Germany), v. 3, 1981 p 287-292
(BLL-Trans-WH-501(9091.9F)) Avail: British Library Lending Div., Boston Spa. Engl.

From experimental experience suggestions were derived for equipment for development of the heat sources of earth and outside air. The size of the heat exchanger is to be determined by the heat extraction by the heat pump. Suggested tube layouts are fitted to the various methods of operation. The most efficient methods of cost reduction for the earth heat source are small distances between tubes (30 to 10 cm) and a 2-layer arrangement. The additional use of a large-area absorber without forced convection in unfurnished attics provided and indication the earth heat pumps are widely applicable to well thermally insulated single-and multiple-family houses. The area of earth from which heat is extracted can in this case be reduced to 50% of the heated living area. Author

N82-20642*# AiResearch Mfg. Co., Torrance, Calif.
BUFFER THERMAL ENERGY STORAGE FOR AN AIR BRAYTON SOLAR ENGINE Final Report
Hal J. Strumpf and Kevin P. Barr 31 Aug. 1981 79 p refs Prepared for JPL
(Contracts NAS7-100; JPL-995136)
(NASA-CR-168657; NAS 1.26:168657;
AIRESEARCH-81-18087) Avail: NTIS HC A05/MF A01 CSCL 10C

The application of latent-heat buffer thermal energy storage to a point-focusing solar receiver equipped with an air Brayton engine was studied. To demonstrate the effect of buffer thermal energy storage on engine operation, a computer program was written which models the recuperator, receiver, and thermal storage device as finite-element thermal masses. Actual operating or predicted performance data are used for all components, including the rotating equipment. Based on insolation input and a specified control scheme, the program predicts the Brayton engine operation, including flows, temperatures, and pressures for the various components, along with the engine output power. An economic parametric study indicates that the economic viability of buffer thermal energy storage is largely a function of the achievable engine life. A.R.H.

N82-20643*# AiResearch Mfg. Co., Torrance, Calif.
STEAM RANKINE SOLAR RECEIVER, PHASE 2 Final Technical Report
L. E. DeAnda and M. Faust 23 Nov. 1981 95 p refs Prepared for JPL
(Contracts NAS7-100; JPL-955157)
(NASA-CR-168656; NAS 1.26:168656;
AIRESEARCH-80-17527) Avail: NTIS HC A05/MF A01 CSCL 10A

A steam rankine solar receiver (SRSR) based on a tubular concept was designed and developed. The SRSR is an insulated, cylindrical coiled tube boiler which is mounted at the focal plane of a fully tracking parabolic solar reflector. The concentrated solar energy received at the focal plane is then transformed to thermal energy through steam generation. The steam is used in a small Rankine cycle heat engine to drive a generator for the production of electrical energy. The SRSR was designed to have a dual mode capability, performing as a once through boiler with and without reheat. This was achieved by means of two coils which constitute the boiler. The boiler core size of the SRSR is 17.0 inches in diameter and 21.5 inches long. The tube size is 7/16 inch I.D. by 0.070 inch wall for the primary, and 3/4 inch I.D. by 0.125 inch wall for the reheat section. The materials used were corrosion resistant steel (CRES) type 321 and type 347 stainless steel. The core is insulated with 6 inches of cerablanket insulation wrapped around the outer wall. The aperture end and the reflector back plate at the closed end section are made of silicon carbide. The SRSR accepts 85 kwth and has a design life of 10,000 hrs when producing steam at 1400 F and 2550 psig. S.L.

N82-20644*# Hydrothermal Power Co. Ltd., Mission Viejo, Calif.
DESIGN, FABRICATION, DELIVERY, OPERATION AND MAINTENANCE OF A GEOTHERMAL POWER CONVERSION SYSTEM Final Report
Dec. 1980 139 p refs Prepared for JPL
(Contract JPL-954404)
(NASA-CR-168653; NAS 1.26:168653) Avail: NTIS HC A07/MF A01 CSCL 10B

The design, fabrication, delivery, operation and maintenance of an Hydrothermal Power Company 1250 KVA geothermal power conversion system using a helical screw expander as the prime

mover is described. Hydrostatic and acceptance testing are discussed. R.J.F.

N82-20645*# Sah (C. T.) Associates, Urbana, Ill.
STUDY OF THE EFFECTS OF IMPURITIES ON THE PROPERTIES OF SILICON SOLAR CELL Final Technical Report
C. T. Sah Oct. 1981 121 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-954685)
(NASA-CR-168665; NAS 1.26:168665; DOE/JPL-954685-81/5; FTR-5) Avail: NTIS HC A06/MF A01 CSCL 10A

The effect of defects across the back-surface-field junction on the performance of high efficiency and thin solar cells, using a developed-perimeter device model for the three-dimensional defects is investigated. Significant degradation of open-circuit voltage can occur even if there are only a few defects distributed in the bulk of the solar cell. Two features in the thickness dependences of the fill factor and efficiency in impurity-doped back-surface-field solar cells are discovered in the exact numerical solution which are associated with the high injection level effect in the base and not predicted by the low-level analytical theory. What are believed to be the most accurate recombination parameters at the Ti center to date are also given and a theory is developed which is capable of distinguishing an acceptor-like deep level from a donor-like deep level using the measured values of the thermal emission and capture cross sections. B.W.

N82-20646*# Solarex Corp., Rockville, Md.
A MODULE EXPERIMENTAL PROCESS SYSTEM DEVELOPMENT UNIT (MEPSDU) Quarterly Report, 1 Sep. - 30 Nov. 1981
30 Nov. 1981 25 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955902)
(NASA-CR-168667; DOE/JPL-955902-81/4; NAS 1.26:168667; QR-4) Avail: NTIS HC A02/MF A01 CSCL 10A

The development of a cost effective process sequence that has the potential for the production of flat plate photovoltaic modules which meet the price goal in 1986 of 70 cents or less per Watt peak is described. The major accomplishments include (1) an improved AR coating technique; (2) the use of sand blast back clean-up to reduce clean up costs and to allow much of the Al paste to serve as a back conductor; and (3) the development of wave soldering for use with solar cells. Cells were processed to evaluate different process steps, a cell and minimodule test plan was prepared and data were collected for preliminary Samics cost analysis. A.R.H.

N82-20647*# Solarelectronics, Inc., Bellingham, Mass.
FLAT-PLATE SOLAR ARRAY PROJECT. TASK 1: SILICON MATERIAL. INVESTIGATION OF THE HYDROCHLORINATION OF SiCl4 Quarterly Report, 1 Oct. 1981 - 8 Jan. 1982
Jeffrey Y. P. Mui 9 Jan. 1982 21 p refs Sponsored in part by DOE
(Contract JPL-956061)
(NASA-CR-168675; DOE/JPL-956061-2; JPL-9950-641; NAS 1.26:168675) Avail: NTIS HC A02/MF A01 CSCL 10A

A two inch diameter stainless steel reactor was designed and built to operate at pressures up to 500 psig for the experimental studies on the hydrochlorination of SiCl4 and metallurgical grade (m.g.) silicon metal to SiHCl3. In order to clearly see the effect of pressure, the experiments were carried out at low reactor pressures of 73 psig and 150 psig, respectively. A large pressure effect on the hydrochlorination reaction was observed between the results of the low pressure experiments and the results of the high pressure experiments. In general, higher pressure produces a higher conversion of SiHCl3, but at a lower reaction rate. The effect of temperature on the reaction rate was studied at 73 psig. Higher reaction temperature gave a higher conversion and a higher reaction rate. Samples of the materials used to construct the hydrochlorination reactor were prepared for corrosion tests. A.R.H.

N82-20648*# Texas Research and Engineering Inst., Inc., Port Neches.
SILICON PRODUCTION PROCESS EVALUATIONS Quarterly Technical Progress Report, 1 Nov. 1981 - 31 Jan. 1982
Feb. 1982 15 p Sponsored in part by DOE
(Contract JPL-996045)
(NASA-CR-168672; DOE/JPL-956045-82/3; JPL-9950-644; NAS 1.26:168672; QTPR-3) Avail: NTIS HC A02/MF A01 CSCL 10A

Chemical engineering analysis was continued for the HSC process (Hemlock Semiconductor Corporation) in which solar cell silicon is produced in a 1,000 MT/yr plant. Progress and status are reported for the primary engineering activities involved in the preliminary process engineering design of the plant base case conditions (96%), reaction chemistry (96%), process flow diagram (85%), material balance (85%), energy balance (60%), property data (60%), equipment design (40%), major equipment list (30%) and labor requirements (10%). Engineering design of the second distillation column (D-02, TCS column) in the process was completed. The design is based on a 97% recovery of the light key (TCS, trichlorosilane) in the distillate and a 97% recovery of the heavy key (TET, silicon tetrachloride) in the bottoms. At a reflux ratio of 2, the specified recovery of TCS and TET is achieved with 20 trays (equilibrium stages, N=20). Respective feed tray locations are 9, 12 and 15 (NF sub 1 = 9, NF sub 2 = 12,, and NF sub 3 = 15). A total condenser is used for the distillation which is conducted at a pressure of 90 psia. Author

N82-20649*# Springborn Labs., Inc., Enfield, Conn.
INVESTIGATION OF TEST METHODS, MATERIAL PROPERTIES, AND PROCESSES FOR SOLAR CELL ENCAPSULANTS Quarterly Progress Report
P. B. Willis Oct. 1981 46 p refs Sponsored in part by DOE
(Contract JPL-954527; JPL Proj. 6072.1)
(NASA-CR-168671; DOE/JPL-954527-81/20; JPL-9950-648; NAS 1.26:168671; QPR-21) Avail: NTIS HC A03/MF A01 CSCL 10A

Encapsulant materials and processes for the production of cost-effective, long-life solar cell modules were investigated. The following areas were explored: (1) soil resistant surface treatment; (2) corrosion protecting coatings from mild steel substrates; (3) primers for bonding module interfaces; and (4) RS/4 accelerated aging of candidate encapsulation compounds B.W.

N82-20650*# Optical Coating Lab., Inc., City of Industry, Calif. Photoelectronics Div.
SILICON SOLAR CELL PROCESS DEVELOPMENT, FABRICATION, AND ANALYSIS Quarterly Report, 1 Jul. - 30 Sep. 1981
H. I. Yoo, P. A. Iles, and D. C. Leung 30 Sep. 1981 61 p refs Sponsored in part by DOE
(Contract JPL-955089)
(NASA-CR-168670; DOE/JPL-955089-81/12; JPL-9950-638; NAS 1.26:168670; QR-10) Avail: NTIS HC A04/MF A01 CSCL 10A

Work has progressed in fabrication and characterization of solar cells from ubiquitous crystallization process (UCP) wafers and LASS ribbons. Gettering tests applied to UCP wafers made little change on their performance compared with corresponding baseline data. Advanced processes such as shallow junction (SJ), back surface field (BSF), and multilayer antireflection (MLAR) were also applied. While BSF by Al paste had shunting problems, cells with SJ and BSF by evaporated Al, and MLAR did achieve 14.1% AMI on UCP silicon. The study of LASS material was very preliminary. Only a few cells with SJ, BSR, (no BSF) and MLAR were completed due to mechanical yield problems after lapping the material. Average efficiency was 10.7% AMI with 13.4% AMI for CZ controls. Relatively high minority carrier diffusion lengths were obtained. The lower than expected Jsc could be partially explained by low active area due to irregular sizes. S.L.

N82-20651*# Siltec Corp., Menlo Park, Calif.
LSA LARGE AREA SILICON SHEET TASK ENHANCED ID SLICING TECHNOLOGY FOR SILICON INGOTS Final Report
George F. Fiegl Dec. 1981 43 p refs Sponsored in part by

DOE Prepared for JPL
(Contract JPL-955282)
(NASA-CR-168668; NAS 1.26:168668; DOE/JPL-955282-81/1) Avail: NTIS HC A03/MF A01 CSCL 10A

A commercially available saw was equipped with a programmable ingot advance/rotation unit and a closed loop cutting edge position control system. Extensive experimentation with ingot rotation revealed that, due to the combination of the anisotropic material character of the monocrystalline silicon and ingot rotation during cutting, severe limitations on productivity were imposed. Cutting edge position control, with low kerf blades reduced the deflection by one order of magnitude thus contributing significantly to the kerf reduction. While prefabricated blade inserts promise great potential for increasing the blade lifetime while decreasing kerf, more fundamental work in the materials area of the bond is required before these blades become an effective production tool. An alternative solution of etched core construction permitted low kerf slicing, but further refinement for greater lifetime is necessary. A.R.H.

N82-20652*# General Electric Co., Philadelphia, Pa. Advanced Energy Programs Dept.
BYPASS DIODE INTEGRATION Final Report
N. F. Shepard, Jr. 11 Dec. 1981 98 p Sponsored in part by DOE
(Contract JPL-955894)
(NASA-CR-168674; NAS 1.26:168674; DOE/JPL-955894-4; JPL-9950-646) Avail: NTIS HC A05/MF A01 CSCL 10A

Protective bypass diodes and mounting configurations which are applicable for use with photovoltaic modules having power dissipation requirements in the 5 to 50 watt range were investigated. Using PN silicon and Schottky diode characterization data on packaged diodes and diode chips, typical diodes were selected as representative for each range of current carrying capacity, an appropriate heat dissipating mounting concept along with its environmental enclosure was defined, and a thermal analysis relating junction temperature as a function of power dissipation was performed. In addition, the heat dissipating mounting device dimensions were varied to determine the effect on junction temperature. The results of the analysis are presented as a set of curves indicating junction temperature as a function of power dissipation for each diode package. B.W.

N82-20653*# Kayex Corp., Rochester, N. Y.
DEVELOPMENT OF ADVANCED CZOCHRALSKI GROWTH PROCESS TO PRODUCE LOW COST 150 kg SILICON INGOTS FROM A SINGLE CRUCIBLE FOR TECHNOLOGY READINESS Quarterly Progress Report, 1 Apr. - 30 Jun. 1981
30 Jun. 1981 27 p refs Sponsored in part by DOE Prepared for JPL
(NASA-CR-108655; NAS 1.26:168655; DOE/JPL-955733-81/3; QPR-3) Avail: NTIS HC A03/MF A01 CSCL 10A

The process development continued, with a total of nine crystal growth runs. One of these was a 150 kg run of 5 crystals of approximately 30 kg each. Several machine and process problems were corrected and the 150 kg run was as successful as previous long runs on CG2000 RC's. The accelerated recharge and growth will be attempted when the development program resumes at full capacity in FY '82. The automation controls (Automatic Grower Light Computer System) were integrated to the seed dip temperature, shoulder, and diameter sensors on the CG2000 RC development grower. Test growths included four crystals, which were grown by the computer/sensor system from seed dip through tail off. This system will be integrated on the Mod CG2000 grower during the next quarter. The analytical task included the completion and preliminary testing of the gas chromatograph portion of the Furnace Atmosphere Analysis System. The system can detect CO concentrations and will be expanded to oxygen and water analysis in FY '82. Author

N82-20654*# Cornell Univ., Ithaca, N. Y. Dept. of Materials Science and Engineering.
EBIC/TEM INVESTIGATIONS OF DEFECTS IN SOLAR SILICON RIBBON MATERIALS Final Report
D. G. Ast Jan. 1981 131 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-954852)
NASA-CR-168666; (DOE/JPL-954852-81/4; JPL-9950-628; NAS 1.26:168666; DOE/JPL-954852-81) Avail: NTIS HC A07/MF A01 CSCL 10A

Transmission electron microscopy was used to investigate the defect structure of edge defined film growth (EFG) material, web dentritic ribbons (WEB), and ribbon to ribbon recrystallized material (RTR). The most common defects in all these materials are coherent first order twin boundaries. These coherent twins can be very thin, a few atomic layers. Bundles of the twins which contain odd numbers of twins will in optical images appear as a seemingly single first twin boundary. First-order coherent twin boundaries are not electrically active, except at locations where they contain intrinstic (grain boundary) dislocations. These dislocations take up small deviations from the ideal twin relation and play the same role in twin boundaries as conventional and play the some role in twin boundaries as conventional edge and screw dislocations in small angle tilt and twist boundaries. B.W.

N82-20655*# National Aeronautics and Space Administration, Washington, D. C.
DYNAMIC ELECTRICAL RESPONSE OF SOLAR CELLS
Jean-Pierre Catani Jun. 1981 42 p Transl. into ENGLISH from CNES Note Technique no. 85 (France), Oct. 1978 p 1-41, 69-87 Translation was announced as N80-11629 Transl. by SCITRAN, Santa Barbara, Calif.
(Contract NASw-3198)
(NASA-TM-76686; NAS 1.15:76686) Avail: NTIS HC A03/MF A01 CSCL 10A

The dynamic response of a solar generator is of primary importance as much for the design and development of electrical power conditioning hardware as for the analysis of electromagnetic compatibility. A mathematical model of photo-batteries was developed on the basis of impedance measurements performed under differing conditions of temperature, light intensity, before and after irradiation. This model was compared with that derived from PN junction theory and to static measurements. These dynamic measurements enabled the refinement of an integration method capable of determining, under normal laboratory conditions, the dynamic response of a generator to operational lighting conditions. Author

N82-20656*# Duke Univ., Durham, N. C. School of Engineering.
RESEARCH ON DESIGN FEASIBILITY OF HIGH-POWER LIGHT-WEIGHT DC-TO-DC CONVERTERS FOR SPACE POWER APPLICATIONS Semiannual Status Report, 30 Nov. 1981
Thomas G. Wilson 30 Nov. 1981 42 p refs
(Grant NsG-3157)
(NASA-CR-168682; NAS 1.26:168682; SAR-9) Avail: NTIS HC A03/MF A01 CSCL 10A

Utilizing knowledge gained from past experience with experimental current-or-voltage step-up dc-to-dc converter power stages operating at output powers up to and in excess of 2 kW, a new experimental current-or-voltage step-up power stage using paralleled bipolar junction transistors (BJTs) as the controlled power switch, was constructed during the current reporting period. The major motivation behind the construction of this new experimental power stage was to improve the circuit layout so as to reduce the effects of stray circuit parasitic inductances resulting from excess circuit lead lengths and circuit loops, and to take advantage of the layout improvements which could be made when some recently-available power components, particularly power diodes and polypropylene filter capacitors, were incorporated into the design. Author

N82-20657# Battelle Pacific Northwest Labs., Richland, Wash.
WATER CONING IN POROUS MEDIA RESERVOIRS FOR COMPRESSED AIR ENERGY STORAGE
L. E. Wiles and R. A. McCann Jun. 1981 117 p refs
(Contract DE-AC06-76-RLO-1830)
(PNL-3470) Avail: NTIS HC A06/MF A01

The development, analysis, and results, are discussed for the two phase (air-water), two dimensional (cylindrical) modeling of compressed air energy storage (CAES) porous media reservoirs. Numerical methods used to deal with the combined effects of the nonlinear terms, the convergent nature of the flow, and the

anisotropy at the wellbore are described. The analysis of water coning was based on a set of reference conditions about which single parameters or groups of parameters were varied to determine their effect on water coning. Results for the simulated operation of a CAES reservoir suggest that water coning should not be a severe problem. Water coning will depend on site specific conditions, particularly the fluid distributions following bubble development. A.R.H.

N82-20658# Committee on Energy and Natural Resources (U.S. Senate).
POTENTIAL FOR HYDROELECTRIC DEVELOPMENT IN ALASKA
Washington GPO 1981 64 p Hearing before the Subcomm. on Water and Power of the Comm. on Energy and Nat. Resources, 97th Congr., 1st Sess., 17 Aug. 1981
(GPO-84-559; Publ-97-31) Avail: Subcommittee on Water and Power

Testimony concerning Alaskan hydroelectricity development is presented. Various public and private organizations were represented. N.W.

N82-20659# Committee on Energy and Natural Resources (U.S. Senate).
HYDROELECTRIC DEVELOPMENT IN NEW ENGLAND
Washington GPO 1981 233 p Hearing before the Subcomm. on Energy Regulation of the Comm. on Energy and Natural Resources, 97th Congr., 1st Sess., 7 Aug. 1981
(GPO-84-558; Publ-97-40) Avail: Subcomm. on Energy Regulation

Hydroelectric power development in New England is examined and the Federal licensing process is presented from different perspectives. State officials, hydrodevelopers, conservation and recreation interests, and power marketers are represented. S.L.

N82-20660# Committee on Energy and Natural Resources (U.S. Senate).
OCEAN THERMAL ENERGY CONVERSION RESEARCH, DEVELOPMENT, AND DEMONSTRATION ACT
Washington GPO 1980 124 p Hearing on S. 1830 before the Subcomm. on Energy Res. and Development of the Comm. on Energy and Natural Resources, 96th Congr., 1st Sess., 15 Oct. 1979
(GPO-56-801; Publ-96-77) Avail: Subcomm. on Energy Res. and Development

A research, development, demonstration, and commercialization program in ocean thermal energy conversion is presented. A national commercialization goal is established an preparation of a plan to accomplish is addressed. S.L.

N82-20661*# TRW, Inc., Redondo Beach, Calif.
CHOPPER-CONTROLLED DISCHARGE LIFE CYCLING STUDIES ON LEAD-ACID BATTERIES Final Report
Joseph J. Kraml and Ernest P. Ames Mar. 1982 79 p refs Sponsored in part by DOE
(Contract DEN3-88)
(NASA-CR-165615; NAS 1.26:165615) Avail: NTIS HC A05/MF A01 CSCL 10C

State-of-the-art 6 volt lead-acid golf car batteries were tested. A daily charge/discharge cycling to failure points under various chopper controlled pulsed dc and continuous current load conditions was undertaken. The cycle life and failure modes were investigated for depth of discharge, average current chopper frequency, and chopper duty cycle. It is shown that battery life is primarily and inversely related to depth of discharge and discharge current. Failure mode is characterized by a gradual capacity loss with consistent evidence of cell element aging. E.A.K.

N82-20662*# Kayex Corp., Rochester, N. Y.
LOW COST CZOCHRALSKI CRYSTAL GROWING TECHNOLOGY. NEAR IMPLEMENTATION OF THE FLAT PLATE PHOTOVOLTAIC COST REDUCTION OF THE LOW COST SOLAR ARRAY PROJECT Final Report, 12 Mar. 1979 - 30 Sep. 1980
E. G. Roberts 30 Sep. 1980 190 p refs Sponsored in part by DOE Prepared for JPL
(NASA-CR-168658; NAS 1.26:168658; JPL-9950-632; DOE/JPL-955270-8076) Avail: NTIS HC A09/MF A01 CSCL 10A

Equipment developed for the manufacture of over 100 kg of silicon ingot from one crucible by rechanging from another crucible is described. Attempts were made to eliminate the cost of raising the furnace temperature to 250 C above the melting point of silicon by using an RF coil to melt polycrystalline silicon rod as a means of rechanging the crucible. Microprocessor control of the straight growth process was developed and domonstrated for both 4 inch and 6 inch diameter. Both meltdown and melt stabilization processes were achieved using operator prompting through the microprocessor. The use of the RF work coil in poly rod melting as a heat sink in the accelerated growth process was unsuccessful. The total design concept for fabrication and interfacing of the total cold crucible system was completed. A.R.H.

N82-20663*# Burt, Hill, Kosar, Rittleman, and Associates, Butler, Pa. Research and Solar Applications Div.
COMMERCIAL/INDUSTRIAL PHOTOVOLTAIC MODULE AND ARRAY REQUIREMENT STUDY. LOW-COST SOLAR ARRAY PROJECT ENGINEERING AREA Final Report
Dec. 1981 326 p refs Sponsored in part by DOE Prepared for JPL
(Contract JPL-955698)
(NASA-CR-168664; NAS 1.26:168664; DOE/JPL-955698) Avail: NTIS HC A15/MF A01 CSCL 10B

Design requirements for photovoltaic modules and arrays used in commercial and industrial applications were identified. Building codes and referenced standards were reviewed for their applicability to commercial and industrial photovoltaic array installation. Four general installation types were identified - integral (replaces roofing), direct (mounted on top of roofing), stand-off (mounted away from roofing), and rack (for flat or low slope roofs, or ground mounted). Each of the generic mounting types can be used in vertical wall mounting systems. This implies eight mounting types exist in the commercial/industrial sector. Installation costs were developed for these mounting types as a function of panel/module size. Cost drivers were identified. Studies were performed to identify optimum module shapes and sizes and operating voltage cost drivers. The general conclusion is that there are no perceived major obstacles to the use of photovoltaic modules in commercial/industrial arrays. R.J.F.

N82-20664*# Mobil Tyco Solar Energy Corp., Waltham, Mass.
LARGE AREA SILICON SHEET BY EFG Annual Progress Report, 1 Oct. 1980 - 30 Sep. 1981
30 Sep. 1981 71 p refs Prepared for JPL
(Contract JPL-954355)
(NASA-CR-168680; NAS 1.26:168680; DOE/JPL-954355-81) Avail: NTIS HC A04/MF A01 CSCL 10A

Progress was made in improving ribbon flatness and reducing stress, and in raising cell performance for 10 cm wide ribbon grown in single cartridge EFG furnaces. Optimization of growth conditions resulted in improved ribbon thickness uniformity at a thickness of 200 micron, grown at 4 cm/minute, and growth at this target speed is routinely achieved over periods of the order of one hour or more. With the improved ribbon flatness, fabrication of large area (50 sq cm) cells is now possible, and 10 to 11% efficiencies were demonstrated on ribbon grown at 3.5 to 4 cm/minute. Factors limiting performance of the existing multiple ribbon furnace were identified, and growth system improvements implemented to help raise throughput rates and the time percentage of simultaneous three-ribbon growth. However, it is evident that major redesign of this furnace would be needed to overcome shortfalls in its ability to achieve the Technical Features Demonstration goals of 1980. It was decided to start construction of a new multiple ribbon furnace and to incorporate the desired improvements into its design. The construction of this furnace is completed. J.M.S.

N82-20665*# Westinghouse Electric Corp., Pittsburgh, Pa. Advanced Energy Systems Div.
A MODULE EXPERIMENTAL PROCESS SYSTEM DEVELOPMENT UNIT (MEPSDU) Quarterly Report, 1 Sep. - 30 Nov. 1981
30 Nov. 1981 40 p Sponsored in part by DOE
(Contract JPL-955909)
(NASA-CR-168659; NAS 1.26:168659;

DOE/JPL-955909-81/4; JPL-9950-634; QR-4) Avail: NTIS HC A03/MF A01 CSCL 10A

Design work for a photovoltaic module, fabricated using single crystal silicon dendritic web sheet material, resulted in the identification of surface treatment to the module glass superstrate which improved module efficiencies. A final solar module environmental test, a simulated hailstone impact test, was conducted on full size module superstrates to verify that the module's tempered glass superstrate can withstand specified hailstone impacts near the corners and edges of the module. Process sequence design work on the metallization process selective, liquid dopant investigation, dry processing, and antireflective/photoresist application technique tasks, and optimum thickness for Ti/Pd are discussed. A noncontact cleaning method for raw web cleaning was identified and antireflective and photoresist coatings for the dendritic webs were selected. The design of a cell string conveyor, an interconnect feed system, rolling ultrasonic spot bonding heat, and the identification of the optimal commercially available programmable control system are also discussed. An economic analysis to assess cost goals of the process sequence is also given. M.D.K.

N82-20666# Committee on Science and Technology (U. S. House).

ENERGY DEMAND FORECASTING

Washington GPO 1981 366 p Hearings before the Subcomm. on Investigations and Oversight of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 14, 1-2 Jun. 1981

(GPO-83-115) Avail: Subcomm. on Investigations and Oversight

Energy demand forecasting and its connection with national energy policies and decisions is examined in light of recent, sharply revised estimates of future energy requirements. Techniques of economic projects are examined. Modeling of energy demands is discussed. Renewable energy sources are discussed. The shift away from reliance of domestic users on oil and natural gas toward electricity as a primary energy resource is examined in the context of the need to conserve energy and expand generating capacity in order to avoid a significant electricity shortfall. R.J.F.

N82-20667*# FWG Associates, Inc., Tullahoma, Tenn.

THEORETICAL DESIGN STUDY OF THE MSFC WIND-WHEEL TURBINE Final Report

Walter Frost and Philip A. Kessel Mar. 1982 44 p refs

(Contract NAS8-34387)

(NASA-CR-3532; NAS 1.26:3532) Avail: NTIS HC A03/MF A01 CSCL 10A

A wind wheel turbine (WWT) is studied. Evaluation of the probable performance, possible practical applications, and economic viability as compared to other conventional wind energy systems is discussed. The WWT apparatus is essentially a bladed wheel which is directly exposed to the wind on the upper half and exposed to wind through multiple ducting on the lower half. The multiple ducts consist of a forward duct (front concentrator) and two side ducts (side concentrators). The forced rotation of the wheel is then converted to power through appropriate subsystems. Test results on two simple models, a paper model and a stainless steel model, are reported. Measured values of power coefficients over wind speeds ranging from 4 to 16 m/s are given. An analytical model of a four bladed wheel is also developed. Overall design features of the wind turbine are evaluated and discussed. Turbine sizing is specified for a 5 and 25 kW machine. Suggested improvements to the original design to increase performance and performance predictions for an improved WWT design are given. S.L.

N82-20668*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

PERFORMANCE MAPPING STUDIES IN REDOX FLOW CELLS

Mark A. Hoberecht and Lawrence H. Thaller Sep. 1981 12 p refs

(Contract DE-AI04-80AL-12726)

(NASA-TM-82707; DOE/NASA/12726-13; NAS 1.15:82707; DE82-003288) Avail: NTIS HC A02/MF A01 CSCL 10A

Pumping power requirements in any flow battery system constitute a direct parasitic energy loss. It is therefore useful to determine the practical lower limit for reactant flow rates. Through the use of a theoretical framework based on electrochemical first principles, two different experimental flow mapping techniques were developed to evaluate and compare electrodes as a function of flow rate. For the carbon felt electrodes presently used in NASA-Lewis Redox cells, a flow rate 1.5 times greater than the stoichiometric rate seems to be the required minimum. Author

N82-20669*# Tracor MB Associates, San Ramon, Calif.

EQUIPMENT DEVELOPMENT FOR AUTOMATED ASSEMBLY OF SOLAR MODULES Final Report

John J. Hagerty Jan. 1982 174 p refs Sponsored in part by DOE Prepared for JPL

(Contract JPL-955699)

(NASA-CR-168663; NAS 1.26:68663; DOE/JPL-955699-81; MB-R-81/14) Avail: NTIS HC A08/MF A01 CSCL 10A

Prototype equipment was developed which allows for totally automated assembly in the three major areas of module manufacture: cell stringing, encapsulant layup and cure and edge sealing. The equipment is designed to be used in conjunction with a standard Unimate 2000B industrial robot although the design is adaptable to other transport systems. Author

N82-20670# Air Force Academy, Colo. Physical Chemistry and Electrochemistry Div.

LOW TEMPERATURE, CHLOROALUMINATE THERMAL CELLS Final Report, 30 Sep. 1981

Robert L. Vaughn Nov. 1981 39 p refs

(AF Proj. 2303)

(AD-A108727; FJSRL-TR-81-0012) Avail: NTIS HC A03/MF A01 CSCL 10/3

This report summarizes the results of single cell studies on thermal cells containing sodium tetrachloroaluminate electrolyte. The best performing cells delivered 100 Wh/kg at a lifetime of 143 minutes to 75% of initial closed circuit voltage. Such cells operated at 200 C at a current density of 15mA/sq cm. A limited photomicroscopy study revealed a reaction between the lithium alloy anode and separating electrolyte when the cell is stored at 80 C. The MoO2CL2 and Et4N(MoCl6) were studied as possible alternate molybdenum cathodes, but these materials did not show promising performance. Author (GRA)

N82-20671# Air Force Engineering and Services Center, Golden, Colo.

STATE-OF-THE-ART REVIEW OF SOLAR PONDS Final Report

William A. Tolbert Apr. 1981 16 p refs

(AF Proj. 2054)

(AD-A109038; DOE/SSO-4042/1) Avail: NTIS HC A02/MF A01 CSCL 13/2

This report provides a brief but concise review of solar pond technologies and their potential for application within the military. The report covers salt gradient solar ponds (SGSP), shallow solar ponds (SSP), saltless convecting solar ponds, gel ponds, viscosity stabilized ponds, and membrane ponds. In addition, several criteria were evaluated with respect to solar ponds. These included reliability, maintainability, efficiency, survivability, environmental impact and economics. Research and development requirements and ongoing activities were also summarized. This report documents one of several ongoing state-of-the-art reviews of solar technologies performed by an Air Force liaison office with the Department of Energy. Author (GRA)

N82-20672# Air Force Engineering and Services Center, Golden, Colo. Research and Technology Liaison Office.

STATE-OF-THE-ART REVIEW OF LOW-COST COLLECTOR TECHNOLOGIES Final Report

William A. Tolbert Jun. 1981 13 p refs

(AF Proj. 2054)

(AD-A109039; DOE/SSO-4042/2) Avail: NTIS HC A02/MF A01 CSCL 13/2

This report provides a brief but concise review of low-cost solar collector technologies and their potential for application within the military. The report covers low-cost, light-weight concepts for flat-plate collectors, parabolic trough collectors, heliostats and parabolic dish collectors. In addition, several criteria were evaluated with respect to low-cost collector technologies.

These included reliability, maintainability, survivability, mobility/erectibility, environmental impact and economics. Research and development requirements and ongoing activities were also summarized. This report documents one of several ongoing state-of-the-art reviews of solar technologies performed by an Air Force liaison office with the Department of Energy.
Author (GRA)

N82-20673# Honeywell Power Sources Center, Horsham, Pa.
HIGH EFFICIENCY LITHIUM-THIONYL CHLORIDE CELL Quarterly Report, 9 Jul. - 8 Oct. 1981
N. Doddapaneni Fort Monmouth, N.J. Army Electronics Research and Development Command Jan. 1982 36 p refs
(Contract DAAK20-81-C-0381; DA Proj. 1L1-62705-AH-94)
(AD-A110331; DELET-TR-81-0381-2; QR-2) Avail: NTIS HC A03/MF A01 CSCL 10/3

Cathode polarization and discharge performance was studied at -20 and -40 F. It is shown that the limiting currents of Li/SOCl2 cells decrease linearly with reciprocal temperature and an Arrhenius temperature dependence of limiting current is not observed between the temperatures -40 and 75 F. Cathode variables such as carbon substrate, thickness and density on the cathode performance were evaluated at 0 F and 75 F. Cathode polarization and performance were improved with catalyzed cathodes containing 5% Teflon binder. GRA

N82-20674# Texas Univ. at Arlington. Dept. of Chemistry.
THE DESIGN OF SEMICONDUCTOR PHOTOELECTROCHEMICAL SYSTEMS FOR SOLAR ENERGY CONVERSION
Allen J. Bard 21 Dec. 1981 34 p refs Submitted for publication
(Contract N00014-78-C-0592; NR Proj. 051-693)
(AD-A109477; TR-20) Avail: NTIS HC A03/MF A01 CSCL 20/12

The principles and applications of semiconductor electrodes in photoelectrochemical (PEC) cells for carrying out useful chemical reactions are described. The factors in the design of efficient and stable systems and semiconductor particulate systems constructed on the basis of PEC cell principles are discussed.
Author (GRA)

N82-20675# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
AN ECONOMIC ANALYSIS OF AIR CONDITIONING SYSTEMS WITH OFF-PEAK CHILLED-WATER STORAGE M.S. Thesis
Bernard J. McMullen and Nickolaos D. Papaprokopiou Sep. 1981 240 p refs
(AD-A109876; AFIT-LSSR-66-81) Avail: NTIS HC A11/MF A01 CSCL 13/1

This thesis investigates current methods of chilled-water storage for air conditioning applications and the economics of chilled-water storage with time-of-use electric utility rates. Current methods of chilled-water storage are investigated by comparing costs of construction materials for storage tanks and effectiveness and costs of anti-blending systems. The economics of chilled-water storage are analyzed by computing total life cycle costs of alternative air conditioning systems for two different sized buildings. Computer simulation is used to determine electric consumption for the buildings. The simulation of each building contains three options: no chilled-water storage, chiller operated only at night, and a small chiller supplemented by stored chilled-water. A gunite or styrofoam tank with a moving partition anti-blending system is the least expensive and most effective storage system. The economics of chilled-water storage are sensitive to the size of the building analyzed. Operating the small chiller with supplemental chilled-water is economical in the smaller building. No chilled-water storage is the most economical option in the larger building. Operation of the chiller only at night was never economical. Author (GRA)

N82-20676# Hydrologic Engineering Center, Davis, Calif.
USE OF NON-SEQUENTIAL TECHNIQUES IN THE ANALYSIS OF POWER POTENTIAL AT STORAGE PROJECTS
Gary M. Franc Jun. 1981 19 p refs Presented at the Waterpower 81st Conf., Washington, D.C., Jun. 1981
(AD-A109788; HEC-TP-80) Avail: NTIS HC A02/MF A01 CSCL 10/2

An electronic computer procedure is described that uses an estimate of power storage available at a dam site to make estimates of average annual energy and dependable capacity using a non-sequential methodology. Comparisons of this method against the more traditional sequential routing analysis are performed. Author (GRA)

N82-20677# Hydrologic Engineering Center, Davis, Calif.
POTENTIAL ENERGY AND CAPACITY GAINS FROM FLOOD CONTROL STORAGE REALLOCATION AT EXISTING U.S. HYDROPOWER RESERVOIRS
Bill S. Eichert and Vernon R. Bonner Jun. 1981 26 p refs Presented at the Waterpower 81st Intern. Conf. on Hydropower, Washington, D.C., 22-24 Jun. 1981
(AD-A109787; HEC-TP-79) Avail: NTIS HC A03/MF A01 CSCL 13/2

This paper describes the procedures and results of an investigation to evaluate potential increases in nationwide hydropower production that could be achieved by reallocation of flood control storage at existing hydropower reservoirs. One aspect of the investigation considered only the increase in energy that could be achieved by storage reallocation; a second aspect considered potential gains in both energy and capacity that could be achieved by adding to the existing installed capacity as well as storage reallocation. The investigation was performed by the Hydrologic Engineering Center of the U.S. Army Corps of Engineers, and is a component of a technical overview study which is part of the National Hydropower Study. Author (GRA)

N82-20678# Hydrologic Engineering Center, Davis, Calif.
POTENTIAL FOR INCREASING THE OUTPUT OF EXISTING HYDROELECTRIC PLANTS
Darryl W. Davis and John J. Buckley Jun. 1981 26 p refs Presented at the Waterpower 81st Intern. Conf. on Hydropower, Washington, D.C., 22-24 Jun. 1981
(AD-A109772; HEC-TP-78) Avail: NTIS HC A03/MF A01 CSCL 10/2

The potential for increasing power output both through physical improvements in generating equipment and by changes in the manner that existing projects are operated were investigated and estimates of power increase prepared. The investigation was nationwide in scope, including Hawaii, Alaska, and Puerto Rico. All existing hydroelectric plants, regardless of ownership, were investigated for improvement in power output. The potential is identified by the type of improvement and is reported as aggregate regional values and national summaries. GRA

N82-20679# Kaiser Engineers, Oakland, Calif.
INDUSTRIAL UTILIZATION OF WASTE-DERIVED ENERGY. VOLUME 2: APPENDICES 1 AND 2
Sep. 1981 201 p refs
(Contract DE-AC03-78CS-20030)
(DE82-003287; DOE/CS-20030/2) Avail: NTIS HC A10/MF A01

The economic and technical feasibility of producing medium Btu fuel gas in a partial oxidation unit (Purox System) from a combination of both rural and urban wastes was determined. Institutional aspects, a review of alternative technologies and a program recommendation are presented. DOE

N82-20680# EMCON Associates, San Jose, Calif.
STATE OF THE ART OF LANDFILL GAS RECOVERY
John Pacey, David Armstron, Costa Halvadakis, Gail Karpinski, and Marya Donch Jul. 1981 117 p refs Prepared for Argonne National Lab., Ill.
(Contract W-31-109-eng-38)
(DE82-003261; ANL/CNSV-TM-85) Avail: NTIS HC A06/MF A01

Optimization of methane recovery from landfills involves management of the physical and reclaimed factors associated with extraction of the gas. The technology of gas-recovery enhancement is rapidly evolving and is linked closely with numerous site-specific variables. The state-of-the-art study describes the most common recovery-system techniques and methodologies, and operates some promising alternative methods that can affect future recovery designs and mathematical models.

Gas extraction characteristics are summarized for eight on-line and pending systems. DOE

N82-20681# McElroy (Ralph) Co., Austin, Tex.
INTRODUCTION TO GLOBAL ENERGY PROBLEMS
M. S. Ussher Sep. 1981 18 p Transl. into ENGLISH from "Introduccion a la Problematica Energetica Global" (Argentina), Sep. 1981 p 95-102 Presented at a Symp. on Evaluation and Reinforcement of Pavements and Energy in Transportation. Arg. Congr. of Highway Admin. and Traffic, 4-6 Sep. 1980, San Miguel de Tucuman, Argentina Prepared for Argonne National Lab., Ill.
(Contract W-31-109-eng-38)
(DE81-030284; ANL-Trans-1197) Avail: NTIS HC A02/MF A01

Aspects of global energy problems are briefly discussed. A review of the energy situation in Argentina disclosed that it has adequate industrial energy supplies and sufficient petroleum resources. Development of new technologies, an energy conservation plan, and future energy supplies are discussed.DOE

N82-20682*# Kayex Corp., Rochester, N. Y.
DEVELOPMENT OF ADVANCED CZOCHRALSKI GROWTH PROCESS TO PRODUCE LOW-COST 150 kg SILICON INGOTS FROM A SINGLE CRUCIBLE FOR TECHNOLOGY READINESS Quarterly Progress Report, 1 Jan. - 31 Mar. 1981
1981 16 p
(Contracts NAS7-100; JPL-955733)
(NASA-CR-168685; NAS 1.26:168685; DOE/JPL-955733-T1; DE81-028929; QPR-2) Avail: NTIS HC A02/MF A01 CSCL 10A

The modified CG2000 crystal grower construction, installation, and machine check out was completed. The process development check out proceeded with several dry runs and one growth run. Several machine calibrations and functional problems were discovered and corrected. Exhaust gas analysis system alternatives were evaluated and an integrated system approved and ordered. Several growth runs on a development CG2000 RC grower show that complete neck, crown, and body automated growth can be achieved with only one operator input. DOE

N82-20683*# Union Carbide Corp., Sistersville, W. Va.
FLAT-PLATE SOLAR-ARRAY PROJECT. EXPERIMENTAL PROCESS SYSTEM DEVELOPMENT UNIT FOR PRODUCING SEMICONDUCTOR-GRADE SILICON USING THE SILANE-TO-SILICON PROCESS Quarterly Progress Report, Jul. - Sep. 1981
1981 54 p
(Contract NAS7-100; JPL-954334)
(NASA-CR-168503; NAS 1.26:168503; DOE/JPL-954334-20; DE82-002092) Avail: NTIS HC A04/MF A01 CSCL 10A

The engineering design, fabrication, assembly, operation, economic analysis, and process support R and D for an Experimental Process System Development Unit (EPSDU) are reported. About 95% of purchased equipment is received and will be reshipped to the West Coast location. The Data Collection System is completed. In the area of melting/consolidation, to the system using silicon powder transfer, melting and shotting on a pseudocontinuous basis is demonstrated. It is proposed to continue the very promising fluid bed work. DOE

N82-20684*# Ross (Bernd) Associates, San Diego, Calif.
DEVELOPMENT OF AN ALL-METAL THICK-FILM COST-EFFECTIVE METALLIZATION SYSTEM FOR SOLAR CELLS Quarterly Report, Nov. 1980 - Apr. 1981
Bernd Ross Sep. 1981 39 p refs
(Contracts NAS7-100; JPL-955688)
(NASA-CR-168502; NAS 1.26:168502; DOE/JPL-955688-80/10; DE-82-001936; QR-3) Avail: NTIS HC A03/MF A01 CSCL 10A

Screened electrodes made from fluorocarbon activated copper paste and silver fluoride activated copper paste, tape adhesion and scratch tests were studied. Experiments were conducted with variations in past parameters, firing conditions, including gas ambients, furnace furniture, silicon surface and others. A liquid medium intended to provide transport during the carbon fluoride decomposition, is incorporated in the paste. DOE

N82-20685# California Univ., Livermore. Lawrence Livermore Lab.
ASSESSMENT OF THE SUITABILITY OF AGRICULTURAL WASTE WATER FOR GEOTHERMAL POWER PLANT COOLING IN THE IMPERIAL VALLEY. 1: WATER QUALITY
W. F. Morris Sep. 1981 36 p refs
(Contract W-7405-eng-48)
(DE82-001869; UCID-19205) Avail: NTIS HC A03/MF A01

Evaluation of the quality of agricultural waste water is the first step in assessing the suitability of agricultural waste water for geothermal power plant cooling. Samples of agricultural waste water from the New and Alamo rivers located in the Imperial Valley of California were analyzed. Determinations of standard water quality parameters, solids content, and inorganic compositions of the solids were made. The results are compared with data on samples of irrigation water and steam condensate also obtained from sites in the Imperial Valley. The data were evaluated in relation to cooling tower operation, waste generation, and waste disposal. DOE

N82-20686# California Univ., Livermore. Lawrence Livermore Lab.
PROTOTYPE FLYWHEEL SPIN TESTING PROGRAM Final Report
D. W. Rabenhorst and W. O. Wilkinson Apr. 1981 59 p
(Contract W-7405-eng-48)
(DE82-003220; UCRL-15381; SDO-5988) Avail: NTIS HC A04/MF A01

Ten composite material flywheels provided by Lawrence Livermore National Laboratory were spin tested at the Johns Hopkins University Applied Physics Laboratory. The test facilities and procedures are described. The flywheels tested range in size from 12.0 to 24.0 in.-dia; in weight from 5.0 to 28.5 lb.; and in energy at failure up to 711 watt hours. The objective of this flywheel test program was to determine for each flywheel the rotational speed at flywheel failure and within the capability of the facility, the initiation and mode of failure of the flywheel. The results are tabulated. DOE

N82-20687# United Technologies Research Center, East Hartford, Conn.
TECHNICAL AND ECONOMIC ASSESSMENT OF FLUIDIZED-BED-AUGMENTED COMPRESSED AIR ENERGY-STORAGE SYSTEM. VOLUME 3: PRECONCEPTUAL DESIGN
A. J. Giramonti, R. D. Lessard, D. Merrick (Coal Processing Consultants Ltd.), and M. J. Hobson (Acres American Inc.) Sep. 1981 251 p refs Prepared for Pacific Northwest Lab.
(Contract DE-AC06-77RL-01830)
(DE82-001945; PNL-3686-Vol-3) Avail: NTIS HC A12/MF A01

A technical and economic assessment of fluidized bed combustion augmented compressed effort are presented in three volumes. Volume III - Preconceptual Design contains the system analysis which led to the identification of a preferred component configuration for a fluidized bed combustion augmented compressed air energy storage system, the results of the effort which transformed the preferred configuration into preconceptual power plant design, and an introductory evaluation of the performance of the power plant system during part-load operation and while load following. DOE

N82-20688# Midwest Research Inst., Golden, Colo.
ELECTRIC UTILITY VALUE ANALYSIS METHODOLOGY FOR WIND ENERGY CONVERSION SYSTEMS
L. R. Bush, C. Keith Cretcher, and Ted H. Davey Sep. 1981 31 p refs
(Contract DE-AC02-77CH-00178)
(DE82-003573; SERI/TR-98336-1) Avail: NTIS HC A03/MF A01

The methodology summarized in this report was developed in support of a study of the value of augmenting conventional electric energy generation with wind energy conversion systems (WECS). A major objective of the value analysis study is the creation of an analytical methodology to assess WECS installed in a utility's generation system. The pertinent measures of value include both the displacement of conventional fuels measured

in volumetric and economic terms, and the potential for capacity credit, realized either through the sale of capacity of deferral of new installations. Recognizing the strong site dependence of wind energy conversion, a second major objective of the value analysis study is the application of the methodology to several candidate utilities. These results will illustrate the practicability of the methodology and identify any deficiencies, alloy a comparison of relative WECS value among the sites studied, and develop background information pertinent to possible selection decisions for WECS siting and level of penetration. The specific purpose of this report is to outline the methodology developed in support of the value analysis study. DOE

N82-20689# European Space Agency, Paris (France).
A GENERAL CALCULATION METHOD FOR THE DYNAMIC RESPONSE TO DISCRETE GUST DISTRIBUTIONS AS EXEMPLIFIED BY THE ROTOR BLADE OF A WIND ENERGY CONVERTER
Dieter Ludwig Oct. 1981 61 p refs Transl. into ENGLISH from "Allgemeine Loesungsmethode zur ermittlung der dynamischen Antwort auf eine diskrete Einzelboe am Beispiel des Rotorblattes eines Windenergiekonverters" Rept. DFVLR-FB-80-12 DFVLR, Goettingen, West Germany, Mar. 1980
(ESA-TT-684; DFVLR-FB-80-12) Avail: NTIS HC A01/MF A01; DFVLR, Cologne DM 13.60

The dynamic response of elastic structures to discrete gust distributions is calculated using a method which assumes that the modal parameters of the structure (obtained through eigenanalyses or ground vibration tests) are known. The number of spanwise bending modes and the distribution of discrete gusts are not restricted. In order to obtain a complete solution in the shortest possible computing time, the generalized forces caused by excitation and induced motion are approximated by means of the standard exponential forms of the Wagner and Kussner functions. Two discrete gust distributions were analyzed. For long gusts, a stress calculation is needed to show if the calculated loads are permissible. For short gusts the effects of higher bending modes must be considered. Author (ESA)

N82-20690# Environmental Protection Agency, Ann Arbor, Mich. Standards Development and Support Branch.
AN ENERGY DEMAND MODEL FOR LIGHT-DUTY VEHICLES, WITH CONCEPTS FOR ESTIMATING FUEL CONSUMPTION
Terry Newell Apr. 1981 34 p refs
(PB82-102468; EPA-AA-SDSB-81-2) Avail: NTIS HC A03/MF A01 CSCL 10A

The development of the energy demand modeling program, the use of the program, and the verification of using the energy demand concept to estimate vehicle fuel consumption are described. In addition, several applications of the model are presented and other potential applications are discussed. GRA

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N82-20691# Los Alamos Scientific Lab., N. Mex. Environmental Surveillance Group.
ENVIRONMENTAL SURVEILLANCE AT LOS ALAMOS, 1980
Apr. 1981 164 p refs
(Contract W-7405-eng-36)
(LA-8810-ENV) Avail: NTIS HC A08/MF A01

Routine monitoring for radiation and radioactive or chemical substances is conducted on the Laboratory site and in the surrounding region to determine compliance with appropriate standards and permit early identification of possible undesirable trends. Results and interpretation of the data for 1980 on penetrating radiation, chemical and radiochemical quality of ambient air, surface and ground water, municipal water supply, soils and sediments, food, and airborne and liquid effluents are presented. Comparisons with appropriate standards and regulations or with background levels from natural or other non-Laboratory sources provide a basis for concluding that environmental effects attributable to Laboratory operations are minor and cannot be considered likely to result in any hazard to the population of the area. Some unusual environmental conditions in the Laboratory environs are described. A.R.H.

N82-20692# Committee on Science and Technology (U. S. House).
ENVIRONMENTAL EFFECTS OF SEWAGE SLUDGE DISPOSAL
Washington GPO 1981 112 p Hearing before the Subcomm. on Natural Resources, Agriculture Res. and Environment of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 24, 27 May 1981
(GPO-83-840) Avail: Subcomm. on Natural Resources, Agriculture Res. and Environment

The environmental effects of sewage waste disposal are discussed. The mechanisms by which the ocean waters are polluted by sludge disposal in landfills and on farmlands are considered. The effects of disposal directly into the oceans is also examined. Various disposal options and their attendant risks are discussed. R.J.F.

N82-20693# California Univ., Irvine. Sanitary Engineering and Environmental Health Research Lab.
ENVIRONMENTAL QUALITY RESEARCH-FATE OF TOXIC JET FUEL COMPONENTS IN AQUATIC SYSTEMS Annual Report, 1 Jun. 1980 - 31 May 1981
Robert C. Cooper, Leon Hunter, P. C. Ulrichs, and Robert Okazaki Wright-Patterson AFB, Ohio Air Force Aerospace Medical Research Lab. Dec. 1981 61 p refs
(Contract F33615-80-C-0512; AF Proj. 6302)
(AD-A109790; AFAMRL-TR-81-101) Avail: NTIS HC A04/MF A01 CSCL 06/2

This report contains the results of an investigation of the potential toxic effects of the jet fuel JP-4 (petroleum-based and shale-based) on the aqueous environment. Composition of different JP-4 samples and their water extracts are compared. Techniques for the formation and analysis of water soluble extracts of JP-4 are described together with preliminary bioassay procedures using the aquatic organisms, Daphnia magna and Artemia salina. The first steps in the development of a mathematical model designed to describe and predict the effects of jet fuel spills are reported. Author (GRA)

N82-20694# Commissariat a l'Energie Atomique, Grenoble (France).
STATISTICAL ANALYSIS OF METEOROLOGICAL DATA ABOVE A GIVEN SITE APPLIED TO ATMOSPHERIC DIFFUSION PROBLEMS
A. Antoniadis Mar. 1981 83 p refs In FRENCH; ENGLISH summary
(DE81-700668; CEA-R-5098) Avail: NTIS (US Sales Only) HC A05/MF A01; DOE Depository Libraries

A method for clarifying the meteorological conditions above a given site and an objective distinction of a number of predominant weather types are presented. For each weather type atmospheric diffusion coefficients are estimated and numerical solutions of the diffusion equation are compared with observed experimental data. DOE

N82-20695# Acurex Corp., Mountain View, Calif. Energy and Environmental Div.
ADVANCED PULVERIZED-COAL COMBUSTOR FOR CONTROL OF NO SUB x EMISSIONS Quarterly Report, 1 Jul. - 30 Sep. 1981
R. L. Pam, S. T. Suttmann, and J. T. Kelly 30 Oct. 1981 13 p refs
(Contract DE-AC22-80PC-30296)
(DE82-002653; DOE/PC-30296/4; QR-4) Avail: NTIS HC A02/MF A01

The program uses an idealized one-dimensional combustor, incorporating fuel staging. The development of a comprehensive computer model which allows NO mechanisms and rates to be extracted from the experimental data, is reported. A coal devolatilization model was developed and integrated into the PROF code. Combustor curing and facility build up was completed. T.M.

N82-20696# Brookhaven National Lab., Upton, N. Y.
CALCIUM SILICATE CEMENTS FOR DESULFURIZATION OF COMBUSTION GASES Semiannual Progress Report, 1 Oct. 1980 - 31 Mar. 1981
H. J. Yoo, P. J. McGauley, M. Steinberg, G. Farber, F. B. Kainz, and J. Pruzansky Jun. 1981 46 p refs
(Contract DE-AC02-76CH-00016)
(DE82-003245; BNL-51430) Avail: NTIS HC A03/MF A01

Commercial calcium silicate bearing Portland Cement Type II (PC III) was identified as a promising regenerative sorbent for the removal of sulfur in the fluidized-bed combustion (FBC) of coal. The PC III is agglomerated in a drum pelletizer by low energy, low cost agglomeration techniques and cured to form pellets in the size range suitable for operating FBC units. The degree of regeneration is almost complete (above 95%) during cyclic use except for the first cycle. The rate of sulfation increases with the sulfation temperature. The rate of regeneration also increases with the regeneration temperature. A small 40 mm I.D. bench scale fluid bed reactor was used to determine the sulfur removal efficiency of the PC III pellet as well as the concentration of the regenerated SO2, using propane gas as a fuel and a reducing agent. The concentration of regenerated SO2 increases with the feed rate of reducing gas and it reaches as high as 24%. Bench scale testing of PC III sorbent in a coal fired 6 in. fluidized bed combustor indicates acceptable performance. An improved process and engineering design utilizing the PC III pellets in a coal fired power plant indicates improved economy in comparison with once through limestone desulfurization. DOE

N82-20697# TRW, Inc., Redondo Beach, Calif.
EVALUATION OF CONTINUOUS OXYDESULFURIZATION PROCESSES Final Technical Report, Sep. 1979 - Jul. 1981
J. F. Jones and D. M. Wever Jul. 1981 106 p
(Contract DE-AC01-79ET-14292)
(DE82-002127; DOE/ET-14292/T1) Avail: NTIS HC A06/MF A01

Three processes for the oxydesulfurization of coal were evaluated in continuous processing equipment designed, built, and/or adapted for the purpose. The three processes differed primarily in the chemical additives (none, sodium carbonate, or ammonia), fed to the 20% to 40% coal/water slurries, and in the oxygen content of the feed gas stream. Temperature, pressure, residence time, flow rates, slurry concentration and stirrer speed were the other primary independent variables. The amount of organic sulfur removed, total sulfur removed and the Btu recovery were the primary dependent variables. DOE

N82-20698# Ames Lab., Iowa.
ADVANCED RESEARCH AND TECHNOLOGY DIRECT UTILIZATION: RECOVERY OF MINERALS FROM COAL FLY ASH. FOSSIL ENERGY PROGRAM Technical Progress Report, 1 Apr. - 30 Jun. 1981
G. Burnet, J. W. Dunker, and M. J. Murtha Sep. 1981 41 p refs
(Contract W-7405-eng-82)
(DE82-003133; IS-4777) Avail: NTIS HC A03/MF A01

The purpose of this research is to develop methods to process fly ash for (1) the separation and use of an iron rich fraction; (2) the recovery of metals (primarily Al, Fe, and Ti); and (3) the use of the process residues. During this report period, research on the HiChlor process for the high temperature chlorination of fly ash included investigation of prechlorinations using Cl2CO gas mixtures to selectively remove iron and titanium, and the physical characterization of fly ash pellets. Gas diffusion coefficients, surface areas, and pore size distributions were measured for both gamma-alumina and fly ash pellets. Experiments on the high temperature sintering of limestone-fly ash mixtures include alumina extractions from sinters prepared using waste materials. High alumina recoveries were obtained for sinters prepared using cement kiln dust as the lime source, and withsmall amounts of coal refuse added as a mineralizer. Sinter feed mixtures prepared from fly ash, kiln dust, and soda ash were also tested. X-ray diffraction measurements were used to identify the soluble and insoluble compounds found in the clinkers produced. Research has been initiated on methods to agglomerate fly ash mixtures for processing. Agglomerators rather than finely divided powder mixtures will be more easily handled, transported and processed. Feed mixtures for both the lime sinter and the HiChlor processes are being studied. A balling disc unit is being used to form agglomerate spheroids. A theoretical analysis of the magnetic separation of fly ash has been completed. GRA

N82-20699# State Univ. of New York, Stony Brook. Marine Sciences Research Center.
COAL WASTE ARTIFICIAL REEF PROGRAM, PHASE 3. VOLUME 1: SUMMARY REPORT Interim Report, Oct. 1981
J. H. Parker, P. M. J. Woodhead, I. W. Duedall, and H. R. Carleton Oct. 1981 79 p refs Sponsored by Electric Power Research Institute
(EPRI Proj. 1341-1)
(DE82-900854; EPRI-CS-2009-Vol-1) Avail: NTIS HC A05/MF A01

The technical feasibility and the environmental effects of a method for ocean disposal of fly ash and scrubber sludge were explored. Techniques were developed for coal waste block fabrication utilizing machines and equipment from the concrete block industry. Accelerated steam curing procedures developed block strengths adequate for industrial handling and stacking. The new fabrication techniques were successfully established at commercial block factories and 450 metric tons (500 short tons) of stabilized wastes were processed into about 15,000 reef-blocks. Two waste materials were used with fly ash to sludge ratios of 4:1 and 1.5:1 respectively. Small numbers of blocks were made separately from fluidized bed combustion residues. In laboratory bioassays and in field tests, the material did not appear to be toxic in the sea. These results all suggested that the blocks are compatible with the marine environment. T.M.

N82-20700# General Electric Co., Schenectady, N. Y.
ELECTROCYCLONE DEVELOPMENT PROGRAM Quarterly Technical Report, Feb. - Apr. 1981
1981 43 p
(Contract DE-AC21-80ET-17091)
(DE81-025062; DOE/ET-17091/T2; FE-7091-10) Avail: NTIS HC A03/MF A01

In response to the need for a high efficiency, high throughput gas cleanup device for pressurized fluidized bed application, General Electric experimented with an elecrostatically augmented cyclone. A principal advantage of the GE Electrocyclone concept is that a 12 ft dia unit can be built with performance comparable to a 10 in conventional cyclone. The use of large Electrocyclones will avoid the plugging and flow imbalance problems which plagued the use of multiclones. The development work is being continued under the present Electrocyclone Development Program. The Electrocyclone Development Program addresses three critical development areas: performance scaleup; performance at high temperature and pressure; and corona charging. The scaleup of Electrocyclone performance will be demonstrated experimentally by cold flow testing of a 36 in-dia unit geometrically similar to the earlier 18-in model. DOE

N82-20701# Hoffman-Holt, Inc., Silver Spring, Md.
ENVIRONMENTAL AND ECONOMIC ASPECTS OF INDIRECT COAL LIQUEFACTION PROCESSES: A REPORT EMPHASIZING THE RELATIONSHIP BETWEEN PRODUCT MIX AND EFFICIENCY
Lawrence Hoffman Sep. 1981 40 p refs
(Contract EPA-68-02-3671)
(PB82-103581; EPA-600/7-81-153) Avail: NTIS HC A03/MF A01 CSCL 07A

Environmental and economic aspects of three indirect liquefaction processes are reported. The following are addressed: U.S. coal resources; indirect coal liquefaction processes; and environmental and economic aspects associated with the considered processes. The conservation of coal resources would be affected by conversion efficiencies, which vary with process and product mix. For the processes considered, for similar liquid to gas ratio values (product mix), the coal to methanol is the most efficient while the Fischer Tropsch is the least efficient. For these processes, the cost per Btu of product at reasonable equivalent liquid/gas ratios is greatest for Fischer Tropsch and the least for the coal to methanol process. GRA

N82-20702# Wyoming Game and Fish Dept., Cheyenne.
WETLAND VEGETATION, ENVIRONMENTAL FACTORS, AND THEIR INTERACTION IN STRIP MINE PONDS, STOCKDAMS, AND NATURAL WETLANDS Final Forest Service General Technical Report
Richard A. Olson Ft. Collins, Colo. Rocky Mountain Forest and Range Experiment Station 21 Sep. 1981 25 p refs
(PB82-113218; FSGTR/RM-85) Avail: NTIS HC A02/MF A01 CSCL 06F

Water regime, chemical features, temperature factors, light penetration, substrate properties, and physical characteristics are described for Northern Great Plains strip mine ponds and stockdams, followed by a discussion of how their interaction determines wetland plant community composition and resulting wildlife habitat quality for consumptive and nonconsumptive resource utilization. GRA

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N82-20703 Iowa State Univ. of Science and Technology, Ames.
THE STRATIGRAPHY OF THE SOUTHERN PAB RANGE, PAKISTAN Ph.D. Thesis
Howard James White 1981 177 p
Avail: Univ. Microfilms Order No. 8128867

The Cretaceous strata exposed in the southern Pab Range, southeast Baluchistan, Pakistan is investigated. It records the precollision deposition history of the Indo-Pakistani continental shelf. The strata comprise two depositional successions, namely, The Early to Late Cretaceous Sembar-Goru-Parh sequence and the Maestrichtian Mughal Kot-Pab sequence. The former began with deposition of black shales on the continental slope (Sembar Formation), succeeded by calcareous shale, marl and micstone of outer shelf origin (Goru Formation), and ended with inner shelf platform carbonates (Parh Limestone). These deep to shallow water lithofacies prograted westward over the continental shelf of the north-advancing Subcontinent. The Mughal Kot-Pab propagation contains the first significant influx of terrigenous sand reaching the western portion of the continental shelf. Deposition environments in the Mughal Kot Formation include inner shelf, prodelta, delta front and distributary channel. A thick succession of shoreface cycles comprises the Pab sandstone. Dissert. Abstr.

N82-20704 West Virginia Univ., Morgantown.
PALEOENVIRONMENTAL ASPECTS OF MIDDLE ORDOVICIAN (BLACK RIVER AND TRENTON) CARBONATES; GERMANY VALLEY, PENDLETON COUNTY, WEST VIRGINIA Ph.D. Thesis
Burchard D. Carter, III 1981 231 p
Avail: Univ. Microfilms Order No. 8127811

The McGraw/McGlone and Nealmont Limestones and the Dolly Ridge Formation in Germany Valley were deposited on a gentle carbonate slope. Five suites of microfacies were recognized: micrites, biomicrites, echinoderm bryozoan biosparites, biosparites (with biopelsparites and intrabiopelsparites), and pelsparites. The micrites were deposited in quiet water environments at all depths. Normal salinity and open circulation prevailed, and the substrate consistency varied from soupy to firm. Terrigenous influxes were partly responsible for low abundances of organisms. The biomicrites were patches of organisms inhabiting these mud substrata, and graded laterally into the micrites. Water movement occurred, but energy was low. The echinoderm bryozoan biosparites were deposited as localized, high energy, wave base sands. Water was shallow and salinity and circulation were open marine. The shifting sand produced an unstable substratum. Dissert. Abstr.

N82-20705 Rensselaer Polytechnic Inst., Troy, N. Y.
DYNAMIC STATISTICAL MODELS FOR DAILY OZONE FORMATION IN METROPOLITAN AREAS Ph.D. Thesis
Felipe Luyanda 1981 401 p
Avail: Univ. Microfilms Order No. 8200467

Two air quality models which relate through simplified chemical and physical assumptions the major factors involved in the ozone formation process in the New York City area (Manhattan) and in the Capital District of New York State area was developed. An objective was to utilize the models to predict the ozone concentrations for different days, for different time periods, and to examine various ozone formation control strategies. The calibrated models were utilized to simulate the levels of the three pollutants (ozone, nitric oxide, nitrogen dioxide) for the different days and time periods in the respective data set. Simulations were also performed to evaluate the effects of policy actions on the concentrations of the pollutants. Dissert. Abstr.

N82-20706 California Univ., Berkeley.
THE INFLUENCE OF SEISMIC SOURCE DIRECTIVITY ON STRONG GROUND MOTIONS Ph.D. Thesis
Jogeshwar Preet Singh 1981 1 p
Avail: Univ. Microfilms Order No. 8200276

The seismic source directivity facet of the source problem is investigated. Its significance in assessment and quantification of earthquake ground motions in the near field is evaluated. The discrepancies between the few available observations of the near field motion in larger earthquakes and the results so far obtained from directivity in strong ground motion is not yet well understood. If this is so, the strong motion data used by the engineering and seismological community to establish ground motion parameters for earthquake resistant design will contain the effect of focusing. Based on the results suggestions are made for incorporating the effects of source directivity and possibly travel path characteristics in procedures used to develop ground motions for design in the near field. Dissert. Abstr.

N82-20707 British Library Lending Div., Boston Spa (England). Meteorological Office.
VARIATION IN THE FIELD OF ATMOSPHERIC PRESSURE AND IN THE ROTATIONAL VELOCITY OF THE EARTH
A. B. Bondarenko and N. S. Sidorenkov [1982] 7 p refs Transl. into ENGLISH from Gidromet. Nauch.-Issled. Tsent. SSSR, T. Vyp. (Leningrad), v. 216, 1979 p 96-101
(BLL-Trans-1491-(9022.552)) Avail: British Library Lending Div., Boston Spa, Engl.

The connection between variations in the angular velocity of terrestrial rotation and the distribution of the atmospheric pressure fields is discussed. An archive was composed of monthly mean sea-level pressure for 242 months from November 1956 to December 1976. Pressure was taken at the nodes of a grid formed by the intersection of meridians every 20 degrees and parallels every 5 degrees. Long-term variations in the relative angular momentum of the atmosphere required to maintain the balance of angular momentum in the Earth-atmosphere system were not observed. T.M.

N82-20708 British Library Lending Div., Boston Spa (England). Meteorological Office.
THE INTER-HEMISPHERICAL HEAT ENGINE AND VARIATIONS IN THE RELATIVE ANGULAR MOMENTUM OF THE ATMOSPHERE
N. S. Sidorenkov, L. G. Nemirovskaya, and N. Yu. Orekhova [1982] 5 p refs Transl. into ENGLISH from Gidrometh. Nauch.-Issled. Tsent. SSSR, T. Vyp. (Leningrad), v. 171, 1977 p 35-37
(BLL-Trans-1490-(9022.552)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

An atmospheric, inter-hemispherical heat engine is discussed. Thermodynamic analysis showed that is causes seasonal variations of the relative angular momentum of the atmosphere and, therefore, seasonal irregularity in the rotation of the Earth. Observational data, which confirm theoretical conclusions, are presented. N.W.

N82-20709 British Library Lending Div., Boston Spa (England). Meteorological Office.
COMPARATIVE TESTS OF GOLD-BEATER'S SKIN AND ALUMINUM OXIDE HUMIDITY SENSORS IN RADIOSONDES
A. M. Balagurov 27 Jul. 1981 9 p refs Transl. into ENGLISH from Tsent. Aerol. Obs., T. Vyp. (Moscow), v. 141, 1980

p 80-85
(BLL-Trans-1518-(9022.552)) Avail: British Library Lending Div., Boston Spa, Engl.

Soviet radiosonde technology is reviewed. Absorption deformation sensors, incorporating a specially processed animal membrane, are discussed. Radiosonde calibration is covered. Improved humidity sensors in the form of the aluminum oxide humidity sensor (AOHS) are also discussed. A special adaptor used to connect the AOHS to the measurement circuit of the RKZ radiosonde is described. N.W.

N82-20710*# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
THEORY OF THE AURORAL MAGNETOSPHERE
Michael Schulz, Y. T. Chiu, and John M. Cornwall (Calif. Univ. at Los Angeles) Sep. 1981 7 p refs
(Contract NASw-3434)
(NASA-CR-168648; NAS 1.26:168648) Avail: NTIS HC A02/MF A01 CSCL 04A

The aurora has come to be understood as a manifestation of energy transfer and plasma transfer from the solar wind to the magnetosphere. The auroral oval seems to be a mapping of the boundary layer that lies just inside the magnetospheric surface, which consists of the magnetopause and neutral sheet. The auroral oval is consequently a region of reversal for the meridional (r,8) component of the magnetospheric convection electric field and thus a region of strong shear in the plasma drift velocity field. The velocity shear seems to account for the formation of eddies in the auroral 'curtain'. Moreover, the Kinematical impedance associated with hot auroral plasma perpendicular electric field across a narrow region of latitude to occur without the formation of a large parallel electric field. The signature of the parallel electric field is such as to produce upgoing ion beams and precipitating electron beams in the PM (afternoon-evening) sector of local time, and to account for the polarity of Region-1 currents as a function of local time. N.W.

N82-20711*# California Inst. of Tech., Pasadena.
GEOCHEMICAL AND SPECTRAL CHARACTERIZATION OF NATURALLY ALTERED ROCK SURFACES Final Report
Luke L. Y. Chang, Sheldon E. Sommer, and William F. Buckingham 23 Dec. 1981 195 p refs Prepared in cooperation with Maryland Univ.
(Contracts JPL-955757; NAS7-100)
(NASA-CR-168673; NAS 1.26:168673; JPL-9950-631) Avail: NTIS HC A09/MF A01 CSCL 08G

The possibility of using the visible-near infrared region for compositional analysis of remotely sensed rock surfaces is studied. This would allow mapping rock type both on the Earth's surface and on other planetary surfaces. Reflectance spectroscopy, economic geology, optical depth determination, and X-ray diffraction mineralogy are discussed. R.J.F.

N82-20712*# National Aeronautics and Space Administration, Washington, D. C.
ATMOSPHERIC CYCLES OF NITROGEN OXIDES AND AMMONIA
A. Bottger, D. H. Ehhalt, and G. Gravenhorst Dec. 1981 133 p Transl. into ENGLISH from "Atmospharische Kreislaufe von Stickoxiden und Ammoniak." Julich, (West Germany), Rept. JUL-1558, Kernforschungsanlage, Nov. 1978 p 1-164 Transl. by Kanner (Leo) Associates, Redwood City, Calif. Original doc. prepared by Inst. for Chem. and Inst. for Atmospheric Chem.
(Contract NASw-3541)
(NASA-TM-76652; NAS 1.15:76652) Avail: NTIS HC A07/MF A01 CSCL 04A

The atmospheric cycles of nitrogenous trace compounds for the Northern and Southern Hemispheres are discussed. Source strengths and destruction rates for the nitrogen oxides: NO, NO2 and HNO3 -(NOX) and ammonia (NH3) are given as a function of latitude over continents and oceans. The global amounts of NOX-N and NH3-N produced annually in the period 1950 to 1975 (34 + 5 x one trillion g NOx-N/yr and 29 + or - 6 x one trillion g NH3-N/yr) are much less than previously assumed. Globally, natural and anthropogenic emissions are of similar magnitude. The NOx emission from anthropogenic sources is 1.5 times that from natural processes in the Northern Hemisphere, whereas in the Southern Hemisphere, it is a factor of 3 or 4 less. More than 80% of atmospheric ammonia seems to be derived from excrements of domestic animals, mostly by bulk deposition: 24 + or - 9 x one trillion g NO3 -N/yr and 21 + or - 9 x one trillion g NH4+-N/yr. Another fraction may be removed by absorption on vegetation and soils. S.L.

N82-20713# Sierra Geophysics, Inc., Arcadia, Calif.
SEISMIC STUDIES OF REGIONAL PATH PROPERTIES OF EURASIA, PART 1 Annual Technical Report, 1 Oct. 1980 - 10 Nov. 1981
Ilene R. Samowitz and David M. Hadley 15 Nov. 1981 57 p refs
(Contract N00014-81-C-0148; ARPA Order 4152)
(AD-A108770; SGI-R-81-044) Avail: NTIS HC A04/MF A01 CSCL 08/11

The goal of this study has been to improve the basis for predicting regional path properties encountered by surface waves propagating in Eurasia. At regional distances the observed seismograms are severely influenced by seismic structure along the path between the source and the receiver. Accurate Earth models therefore play a critical role in the ability both to detect small events and to discriminate between earthquakes and explosions. Once the regional Earth properties and the mode of seismic wave propagation are well understood, seismic source characterization will be much more reliable. The successful completion of modeling regional seismic surface waves requires several steps: (1) construct starting models for each geologic province that are based on a review and synthesis of the geologic and seismic literature; (2) review and collect seismic data for paths crossing each geologic province; (3) reduce the seismic data to group and phase velocity dispersion curves; (4) invert the dispersion data to improve the regional models. This report summarizes work completed during the first year of a two year effort. Although several path averaged models that match the observations have been derived during this contract year, the primary emphasis has been in the first three tasks listed above. GRA

N82-20714# Air Force Geophysics Lab., Hanscom AFB, Mass.
SEISMIC VELOCITY MODELS FOR WESTERN ALLUVIAL BASINS Interim Report
James C. Battis 5 May 1981 27 p refs
(AF Proj. 2309)
(AD-A108153; AFGL-TR-81-0139; AFGL-ERP-740) Avail: NTIS HC A03/MF A01 CSCL 08/7

A study was made of the open literature on the geologic structure of the Basin and Range Province of the western United States. Based on this study, an attempt was made to derive a model of a typical basin for use in estimating the seismic ground motion characteristics of alluvial basins in the designated MX deployment area. Among the topics investigated are dimensions and structure of an average basin and characteristic seismic velocities in the basin interiors. In addition, many of the basins are expected to show significant variations from a typical structure and these variations are discussed. Author (GRA)

N82-20715# Ohio State Univ., Columbus. Dept. of Geodetic Science and Surveying.
THEORIES OF NUTATION AND POLAR MOTION 2
Helmut Moritz Hanscom AFB, Mass. AFGL Sep. 1981 183 p refs
(Contract F19628-79-C-0075; AF Proj. 7600)
(AD-A108999; Rept-318; SCIENTIFIC-8; AFGL-TR-81-0288) Avail: NTIS HC A09/MF A01 CSCL 03/3

The report describes and interrelates various theories of nutation and polar motion based on an Earth model consisting of an elastic mantle and a liquid core. In order to make basic features transparent and to facilitate interrelation and intercomparison, the liquid core is considered homogeneous and incompressible. A detailed treatment of the theory of Molodensky serves as a basis for describing recent advances by Shen and Mansinha, Smith, Wahr, and others; an elementary treatment of the variational approach by Jeffreys and Vicente and a numerical comparison conclude the report. Author (GRA)

N82-20716# Universite Scientifique et Medicale de Grenoble (France). Lab. de Geophysique Interne.
SEISMIC CRUSTAL AND SUBCRUSTAL PHASES PROPA-

GATION. ATTENUATION OF LOCAL PHASES IN WESTERN EUROPE Annual Report, 1 Dec. 1980 - 30 Sep. 1981
P. Mechler, M. Nicolas (Comm. a lEnergie Atomique, Montrouge Cadex, France), B. Massinon (Paris Univ.), and M. Bouchon (Paris Univ.) 30 Oct. 1981 32 p refs
(Grant AF-AFOSR-0082-80; ARPA Order 3291)
(AD-A108501; AFOSR-81-0784TR) Avail: NTIS HC A03/MF A01 CSCL 08/11

The purpose of this study is to evaluate attenuation of local seismic phases in France. Using a set of six earthquakes which occurred in France or in its vicinity, the short period data recorded by a homogeneous seismic network (vertical component) have been used, within a range of epicenter to station paths of 1 deg to 10 deg. Global attenuation versus distance has been determined for each phase Pn, Sn, Pg and Lg and the influence of frequency analysed. For Pn and Sn waves they are of the order of 2, and slightly higher for Pg (2.3) and Lg (2.5) waves. But the amplitude of these waves is largely dependent on the azimuth of propagation. Lg/Pg ratios present a large scatter between 1 and 10 with a mean trend around 3 to 4. We found that the Lg anelastic factor is of the order of 1/0.2 deg at 1Hz, a result to be compared with the values of 1/0.7 deg (Eastern US), 1/0.15 deg and 1/0.35 deg (respectively Northern USSR and South Caspian Sea). The quality factor, computed for each of these local phases, shows a clear dependence on frequency, increasing from some 100 at 1Hz to some 1000 at 10 Hz probably due to scattering effects. GRA

N82-20717# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
COMMENTS ON THE ENERGY SELECTIVE PRECIPITATION OF INNER ZONE ELECTRONS BY IMHOF ET AL
Alfred L. Vampola and George A. Kuck 1 Dec. 1981 15 p refs
(Contract F04701-81-C-0082)
(AD-A109677; TR-0082(2940-05)-4; SD-TR-81-92) Avail: NTIS HC A02/MF A01 CSCL 04/1

This note addresses the interpretation of data from the 1971-89A satellite as published by Imhof et al, in 'The Energy Selective Precipitation of Inner Zone Electrons' in the Journal of Geophysical Research. It discusses the limitations of the data set and demonstrates that the data set is in agreement with the thesis that a source of electron precipitation is colocated with the Soviet VLF transmitter UMS. Author (GRA)

N82-20718*# Naval Research Lab., Washington, D. C. Geophysical and Plasma Dynamics Branch.
A TIME-DEPENDENT THREE-DIMENSIONAL SIMULATION OF THE EARTH'S MAGNETOSPHERE: RECONNECTION EVENTS Interim Report
Stephen H. Brecht, John G. Lyon, Joel A. Fedder, and K. Hain 22 Dec. 1981 41 p refs Sponsored in part by NASA
(RR0530244)
(NASA-CR-164806; NAS 1.26:164806; AD-A109831; NRL-MR-4690) Avail: NTIS HC A03/MF A01 CSCL 04/1

This paper presents the results of a 3-D simulation of the Earth's magnetosphere. The simulation region covered -100 Re < or = x < or = 30 Re, (Y) < or = 40 Re and (Z) < or = Re. The solar wind parameters were Bz = -2 gamma, density of 5 cc and velocity of 400 km/sec. The results show the existence of multiple x-points in the tail. Strong plasma flow is seen to exist in both earthward and tailward directions during formation of neutral lines. The exact magnetic field and plasma behavior is found to be very position dependent. Author (GRA)

N82-20719# SRI International Corp., Menlo Park, Calif.
ANALYSIS OF NUCLEAR PROPAGATION EFFECTS UTILIZING WIDEBAND SATELLITE DATA Final Report, 14 Jan. 1980 - 30 Jan. 1981
Charles L. Rino, Jacqueline Owen, and Robert C. Livingston 1 Apr. 1981 90 p refs
(Contract DNA001-80-C-0077; DNA Proj. 125AAXHX640; SRI Proj. 1284)
(AD-A109683) Avail: NTIS HC A05/MF A01 CSCL 04/1

Previous analyses of the Wideband Satellite data have emphasized the scale-size regime between 500 m and several tens of kilometers. In this report we describe the results of a detailed analysis of the auroral and equatorial total electron content (TEC) structure associated with the various scintillation phenomena. A nighttime equatorial anomaly was a prominent feature in the equatorial data, particularly as the solar cycle maximum approached. In the auroral data we found that an enhanced F region is the primary contributor to steep latitudinal TEC gradients. Because recent data have shown an abrupt steepening of the irregularity spectral density function near 500 m, a careful analysis of the mutual coherence function was performed to see if this feature could be detected in the Wideband scintillation data. The analysis did indeed reveal such a feature, which is evidently a permanent characteristic of the most severely disturbed equatorial irregularity continuum. Author (GRA)

N82-20720# SRI International Corp., Menlo Park, Calif.
EQUATORIAL PLASMA BUBBLES: VERTICALLY ELONGATED WEDGES FROM THE BOTTOMSIDE F LAYER
Roland T. Tsunoda and Robert C. Livingston 1 Apr. 1981 50 p refs
(Contract DNA001-81-C-0076; DNA Proj. 235AAXHX000; SRI Proj. 2623)
(AD-A109685; DNA-TR-81-03) Avail: NTIS HC A03/MF A01 CSCL 04/1

We address the question regarding the two-dimensional shape of equatorial plasma bubbles in the plane transverse to the geomagnetic field. By comparing the east-west spatial relationship of ion-density depletions measured insitu by the Atmospheric Explorer-E (AE-E) satellite to backscatter plumes measured by the ALTAIR radar, we show that plasma bubbles are vertically elongated depletions that extend upward from the bottomside of the F layer, in the form of wedges, rather than more isotropically shaped but isolated structures. The shape of plasma bubbles is inferred from (1) ion-density depletions that exceeded 99 percent in the 'neck' regions of plumes, and (2) the eastward drift velocities of the plumes. The expected electrodynamics of vertically elongated plasma bubbles are consistant with the observations of large eastward drift velocities of plumes that are comparable to the F-region plasma drift measurements made at Jicamarca and to F-region neutral wind measurements made at Kwajalein. The results also reveal that the west wall of large-scale altitude modulations of the bottomside F layer that produces the primary plumes and bubbles becomes structured, and evolves with the generation of secondary plumes and bubbles. Author (GRA)

N82-20721# SRI International Corp., Menlo Park, Calif.
PLACES TV-TRACK, IONOSONDE, AND MAGNETOMETER OPERATIONS Final Report, 1 Apr. 1980 - 31 Jan. 1981
Norman J. F. Chang 1 Jun. 1981 16 p
(Contract DNA001-80-C-0244; DNA Proj. 125AAXHX642; SRI Proj. 1635)
(AD-A109690; DNA-5806F) Avail: NTIS HC A02/MF A01 CSCL 18/3

This report describes the TV tracking system, the slow-scan TV system, the KEL ionosonde, and the magnetometer that were operated in support of the PLACES experiment conducted at Eglin AFB, Florida in December 1980. A procedure for determining the proper launch time and aim point for both the beacon rockets and the probe rocket was developed after post-mission analysis of the first two releases. This procedure contributed to a successful beacon occultation for Event IRIS, and a successful probe penetration for Event JAN. GRA

N82-20722 Texas Univ. at Arlington.
GEOLOGIC EVOLUTION OF THE CONTINENTAL MARGIN OF THE GULF OF TEHUANTEPEC IN SOUTHWESTERN MEXICO Ph.D. Thesis
Luis Antonio Sanchez-Barreda 1981 269 p
Avail: Univ. Microfilms Order No. 8128683

Through the use of surface geology, paleomagnetic data, gravity surveys, and continuous seismic reflection profiles, the evolution of the Gulf of Tehuantepec is detailed as a progression from an open ocean basin to a more restricted basinal setting. Paleomagnetic data from the Mexican states of Chiapas and Oaxaca suggest an equatorial location for the Yucatan block during the Permian. The Gulf of Tehuantepec and its associated coastal plain is divided into three regions based on the character and distribution of the gravity anomalies. The differences in these regions suggest a northerly increase in tectonic activity in the

basin and the coastal plain. A possible extension of the Polochic fault into the Gulf of Tehuantepec is indicated by coincidence of a linear trend of gravity anomalies in the southern coastal plain with the westernmost end of the fault. Dissert. Abstr.

N82-20723 Montana Univ., Missoula.
HYDROLOGY AND SUBSURFACE GEOLOGY OF THE MISSISSIPPIAN MADISON GROUP AND POTENTIAL WATER USE FOR AGRICULTURE AND INDUSTRY, NORTHWESTERN MONTANA PLAINS Ph.D. Thesis
Ann Chalmers Stradley 1981 311 p
Avail: Univ. Microfilms Order No. 8128127

In most areas water quality is not a completely limiting factor for livestock, poultry and certain industries, and some areas have water suitable for municipal use. Much of the water is usable for irrigation, utilizing proper leaching fractions and amendment procedures for specific soils. An additional 408,473 acres are classified as possibly irrigable within the study area. This amount of land could create a potential for substantial additional income annually to the entire economy. Each irrigated acre equals approximately 8 acres of dryland in providing employment opportunities and maintaining comparable standards of living. Utilization of water from the potential aquifer could lead to creation of a broader and more stable economic base. Development of the Madison aquifer for agricultural, municipal and industrial purposes may be economically feasible and within the realm of reasonable use of a renewable resource.
Dissert. Abstr.

N82-20724 California Univ., Berkeley.
OBSERVATIONAL STUDY OF TERRESTRIAL EIGENVIBRATIONS Ph.D. Thesis
Roger Alan Hansen 1981 139 p
Avail: Univ. Microfilms Order No. 8200127

A comprehensive analysis was made of 24 time series of eigenvibration ground motion obtained following four earthquakes. The time series are assumed to be linear combinations of damped harmonics in the presence of noise. Tables were produced of values of the four parameters used in describing eigenvibrations: period of oscillation, amplitude, damping factor Q, and phase together with their statistical uncertainties and 13 torsional modes. The estimation procedures are by the methods of complex demodulation and nonlinear regression that specifically incorporates into the basic model the decaying aspect of the oscillation. Analysis of groups of synthetic modes indicated biases in the regression arising from interference between tails of neighboring spectral peaks. Further analysis showed, however, that it is the tails of these spectral peaks that supply the most information in the estimation. Dissert. Abstr.

N82-20725 Georgia Univ., Athens.
METALLOGENY AND APPLIED EXPLORATION BEDROCK GEOCHEMISTRY (LITHOGEOCHEMISTRY) OF THE SCHEELITE DEPOSITS OF THE NORTHEASTERN BRAZIL TUNGSTEN DISTRICT, BRAZIL. (VOLUME 1: TEXT. VOLUME 2: MAPS) Ph.D. Thesis
Jeffrey Clinton Reid 1981 466 p
Avail: Univ. Microfilms Order No. 8123091

Exploration bedrock geochemistry (lithogeochemistry) was applied at regional, local, and mine scales for the recognition and definition of mineralized and anomalous areas, and to distinguish dispersion halos. Regional coarse-mesh sampling at 25 sq km centers 'found' all major mines and principal prospects using objective cost effective computer processing and mapping of data. Similar treatment given to data from principal mining concessions and prospects with outcropping and buried scheelite mineralization permitted recognition of outcropping mineralization at a distance of approximately 500 m. Ancillary anomalous areas relating to the leakage of hydrothermal solutions through fractures were related to buried mineralization at a depth of about 200 m. Primary dispersion halos for Cu, Mo, W, Be, F from conformable ores were recognized. A proposed volcanic-related primary mineralization model is based on the introduction of tungsten and other trace elements into the terrigenous protoliths by exhalative volcanic-related fumarole processes (leaching and/or juvinile mineralization) at the seafloor sediment interface.
Dissert. Abstr.

N82-20576# Bayerische Akademie der Wissenschaften, Munich (West Germany).
ABSOLUTE DEFLECTIONS OF THE VERTICAL IN THE RHINEGRABEN AREA
C. Gerstenecker, E. Groten, G. Hein, K. Lenze, and H. Schaab *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union for Geodesy and Geophys. 1980 p 3-19 refs (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

N82-20577# Bayerische Akademie der Wissenschaften, Munich (West Germany).
SOLUTION OF THE GEODECTIC BOUNDARY VALUE PROBLEM BY MEANS OF THE VERTICAL GRADIENT OF GRAVITY
Bernhard Heck *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union for Geodesy and Geophys. 1980 p 21-28 refs (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

N82-20582# Bayerische Akademie der Wissenschaften, Munich (West Germany).
PERIODIC CALIBRATION ERRORS OF LACOSTE-ROMBERG MODEL G AND D GRAVITY METERS
W. Jorge and E. Kanngieser *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union for Geodesy and Geophys. 1980 P 81-94 refs Sponsored by Deutsche Forschungsgeimschaft (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

N82-20836# Joint Publications Research Service, Arlington, Va.
SOLAR ACTIVITY, DYNAMICS OF OZONOSPHERE AND POSSIBLE ROLE OF ULTRAVIOLET RADIATION IN HELIOBIOLOGY
B. M. Vladimirskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 15-19 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 12-15 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N82-20726 British Library Lending Div., Boston Spa (England). Meteorological Office.
SYSTEMATIC ERRORS IN STANDARD PRECIPITATION GAUGES, AND RECOMMENDATIONS CONCERNING THE MEASUREMENT OF PRECIPITATION
V. S. Golubev 29 Oct. 1981 11 p refs Transl. into ENGLISH from Glav. Uprav. Gidromet. Sluzh. (Moscow), Vol. 2, 1976 p 320-325 Presented at the 4th All-Union Hydrol. Conf., Moscow, 1976
(BLL-Trans-1450-(9022.552)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

The effects of the wind, the site characteristics, and the instrument characteristics on the accuracy of precipitation measurements are considered. Parallel observations made with rain gages situated close together in two types of terrain (open and sheltered) are used to estimate the random error of the instrument. Data are given in tables to indicate (1) empirical statistical parameters and standard deviations of measured amounts of precipitation; (2) ratio of precipitation totals measured by various types of instruments to the totals returned by the rain gages; (3) ratio of precipitation totals measured with rain gages at different heights to the totals returned by a rain gage at a height of 2.0 m above the Earth's surface; and (4) monthly precipitation totals as measured by rain gages for different sitings of the instruments. The incidence of error in the precipitation

measurements is discussed. Methods of correcting the errors are also addressed. J.M.S.

N82-20727 British Library Lending Div., Boston Spa (England). Meteorological Office.
THE MYSTERY OF THE HICCUPING DINES ANEMONETER
J. Wieringa 11 Feb. 1981 39 p refs Transl. into ENGLISH from Rept. No. V-356 Koninklijk Nederlands Meteorol. Inst. (Netherlands), 1980
(BLL-Trans-1493(9022.552); DRIC-T-6260) Avail: British Library Lending Div., Boston Spa, Engl.

The operation of dines type pressure tube anemometers with linearizing floater recorder was analyzed from first principles, using all available published calibrations and comparisons, and some unpublished laboratory calibrations. It is concluded that the classical dines calibration underestimates measured wind speeds. The response time of the pressure tube and the floater combined is approximately 0.6 sec with 1 inch connecting tubes. This allows good representation of 5 sec gusts. The overspeeding of a dines anemometer is about 5%, comparable to that of a standard cup anemometer. T.M.

N82-20728 British Library Lending Div., Boston Spa (England). Meteorological Office.
THE FORMATION OF DATA FILES FOR THE SOVIET HYDROMETEOROLOGICAL ARCHIVES
R. A. Sherstyukova 11 Feb. 1981 4 p refs Transl. into ENGLISH from Vses. Nauch.-Issled. Inst. Gidromet. Inf. Miroy. Tsent. Danny., T. Vyp. (Moscow), v. 67, 1980 p 119-121
(BLL-Trans-1501-(9022.552)) Avail: British Library Lending Div., Boston Spa, Engl.

A system for the automatic processing of data, requiring standardization of the formats for representing information data sets on data carriers through the development of a language to describe the data, is outlined. A descriptive language is concerned with admissible data structures, descriptive methods, techniques of representation on data carriers, etc. N.W.

N82-20729 British Library Lending Div., Boston Spa (England).
FLUCTUATIONS IN MONTHLY MEAN AIR TEMPERATURE OVER THE USSR FROM 1961 TO 1975
L. G. Polozova and A. A. Grigoryeva 3 Jun. 1981 23 p refs Transl. into ENGLISH from Glav. Geof. Obs. (USSR), v. 438, 1980 p 103-116
(BLL-Trans-1496-(9022.552)) Avail: British Library Lending Div., Boston, Spa, Engl.

The operational data on temperature anomalies from 1961 to 1975 were tested. Errors due to inaccuracy in extraction of data from the nodes of map grids, in visual interpretation, and arising from perforation and transcription to magnetic tape were revealed. Data concerning the monthly mean temperature and precipitation in the Northern Hemisphere up to 1975 was collected. The appropriate climatological analysis was performed. The actual data on fluctuations of monthly mean temperature over the period 1961 to 1975 are given. The boundaries determined by comparative qualitative analysis of regions of synchronous temperaure fluctuations were determined from the quantitative correlation between unsmoothed temperature series. The seasonal correlation coefficients were differentiated in light of the different degree of attenuation with the distance of the correlation between temperature at different points as a function of season. N.W.

N82-20730 British Library Lending Div., Boston Spa (England).
THE USE OF INFRARED RADIOMETERS TO MEASURE THE THERMAL CHARACTERISTICS OF CLOUDS
A. A. Sinkevich [1980] 5 p refs Transl. into ENGLISH from Glav. Geof. Obs., T. Vyp. (USSR), no. 420, 1979 p 105-111
(BLL-Trans-1484-(9022.549)) Avail: British Library Lending Div., Boston Spa, Engl.

A method and apparatus are described which help in excluding a number of systematic errors that arise when measuring temperatures in clouds. Onboard, airborne equipment which takes measurements by means of contact sensors and remote monitoring devices for measurement of the thermal state of clouds are described and evaluated. Results of tests using a prototype radiometer confirmed the effectiveness of the proposed method. M.D.K.

N82-20731 Materials Research Labs., Melbourne (Australia).
PERCENTAGE FREQUENCY DISTRIBUTIONS OF TEMPERATURE AND HUMIDITY FOR AUSTRALIA, 1963 - 1977
J. A. McRae Nov. 1981 203 p refs
(MRL-R-835) Copyright. Avail: Issuing Activity

The frequency distributions of ambient temperature and humidity listed were prepared in the course of a study on the factors of the Australian climatic environment that are of interest to the defence forces. The tables are derived from machine readable records of three hourly readings of wet and dry bulb temperatures. Three hourly readings are generally confined to major cites and to the larger airports and for the majority of stations only seven readings are collected each day. S.L.

N82-20732 Deutscher Wetterdienst, Offenbach am Main (West Germany).
SOCIETAS METEOROLOGICA PALATINA, 1780-1795
1980 271 p refs Proceedings of Symp. anlaesslich der 200. Wiederkehr des Gruendungsjahres der Societas Meteorologica Palatina, Mannheim, West Germany, 13-15 Oct. 1980
(Annals-of-Meteorol-16) Avail: Issuing Activity

The observation of meteorological phenomena utilizing a network of meteorological measuring stations is addressed. The historical development and significance of meteorological networks is discussed in relation to climatological, synoptic, phenological, maritime, and aerological data. Air pollution monitoring, wind measurement networks, and meteorological satellites are also covered. For individual titles, see N82-20733 through N82-20804.

N82-20733 Deutscher Wetterdienst, Offenbach am Main (West Germany).
FROM THE MEASURING NETWORKS OF THE SOCIETAS METEOROLOGICA PALATINA TO THE WORLDWIDE NETWORKS OF TODAY [VOH MESSNETZ DER SOCIETAS METEOROLOGICA PALATINA ZU DEN WELTWEITEN MESSNETZEN HEUTE]
E. Lingelbach *In its* Soc. Meteorol. Palatina, 1780-1795 1980 p 1-9 In GERMAN (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The 200 year history of the meteorological observation and measuring networks is presented. Network observation and its development with the aid of modern technology into contemporary meteorological science is discussed. The establishment of worldwide weather stations, the development of the wireless (an important contribution to weather forecasting especially in marine meteorology and navigation) atmospheric measurements important for aviation, and sonde measurements, are enumerated. Five different meteorological observation networks are outlined: (1) climatological; (2) synoptic networks for land stations; (3) phenological; (4) maritime; and (5) aerological. The problems of weather forecasting introduced theoretical physics and three dimensionality to meteorological science. The development of climatological information is considered. Worldwide measurement of air pollution caused by industrialization and radiation, special wind measurement networks which are important in the utilization of solar and wind energy, soil moisture measurement for agriculture, and meteorological satellites for global weather observation are discussed as part of the historical development of the meteorological measuring networks. E.A.K.

N82-20734 Deutscher Wetterdienst, Neustadt (West Germany).
SOCIETAS METEOROLOGICA PALATINA: 1780-1795
Albert Cappel *In its* Soc. Meteorol. Palatina, 1780-1795 1980 p 10-27 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The operations of the Societas Meteorologica Palatina, an international meteorological observation network, from 1780-1795 are summarized. Highlights include: (1) publication of observations of the stations in the 'Ephemerides'; (2) organization of a phenological observation network with 94 observers in Palatinate; (3) discovery of a lightning conductor; and

(4) experiments with air balloons. The continued value of the 'Ephemerides' in meteorological research is stressed. J.M.S.

N82-20735 Maryland Univ., College Park.
THE ROLE OF REFERENCE STATIONS IN THE SEARCH FOR CLIMATIC REGIONS
H. E. Landsberg *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 28-29 refs (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The significance of accurate long term records in assessing natural and anthropogenic trends in climate is addressed. Emphasis is placed on the effects of urbanization on the long term records. It is indicated that a network of climatological stations at locations where permanance and stability of the surrounding environment can be anticipated is essential. J.M.S.

N82-20736 Deutscher Wetterdienst, Hamburg (West Germany).
MARITIME METEOROLOGICAL MEASURING NETWORKS [MARITIM-METEOROLOGISCHE MESSNETZE]
A. Duensing *In its* Soc. Meteorol. Palatina, 1780-1795 1980 p 30-32 In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The demands made by weather forecasting and climatology on meteorological measuring networks are discussed. Based on the influence of considerations other than scientific, e.g., economics, on the concept of measuring networks and the level of their integration, a draft of future marine meteorological networks is given. J.M.S.

N82-20737 Swiss Inst. of Meteorology, Locarno-Monti.
THE ANETZ PROJECT: PLANNING AND REALIZATION OF A NETWORK OF AUTOMATIC WEATHER STATIONS IN SWITZERLAND [PROJEKT ANETZ: KONZEPT UND REALISIERUNG EINES NETZES VON AUTOMATISCHEN WETTERSTATIONEN IN DER SCHWEIZ]
Juerg Joss *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 33-35 ref In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

A network of automatic weather stations developed by the Swiss Meteorological Institute in collaboration with the Agricultural Research Institute is described. Each station is interrogated every 10 minutes from a minicomputer via telephone line. Operating experience of 42 stations has demonstrated good reliability of the system. J.M.S.

N82-20738 Deutscher Wetterdienst, Offenbach am Main (West Germany). Abteilung Klimatologie.
RESEARCH ON OPTIMAL DENSITY OF METEOROLOGICAL MEASURING NETWORKS IN THE GERMAN METEOROLOGICAL SERVICE AREA [UNTERSUCHUNGEN ZUR OPTIMALEN DICHTE KLIMATOLOGISCHER MESGNETZE IM BEREICH DES DEUTSCHEN WETTERDIENSTES]
Gerhard Mueller *In its* Soc. Meteorol. Palatina, 1780-1795 1980 p 36-38 refs In GERMAN (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Using theoretical developed by Gandin, an optimal density of meteorological measuring networks, in homogeneous areas, is calculated. Accuracy required for spatial interpolation is considered. Correlations between a large number of German climatological stations are computed for arious meteorological parameters. J.M.S.

N82-20739 Landesanstalt fuer Immissions- und Bodennutzungsschutz, Essen (West Germany).
NETWORKS USED BY THE STATE INSTITUTE FOR AIR POLLUTION PREVENTION (ESSEN) TO ASSIGN RESPONSIBILITY FOR AIR POLLUTION [MESSNETZE DER LANDESANSTALT FUER IMMISSIONSSCHUTZ (ESSEN) ZUR ERMITTLUNG VON IMMISSIONSBELASTUNGEN]
S. Kuelske *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 39-41 In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Air quality measuring programs of the State Institute for Air Pollution Prevention are described. Area covering measurements are taken using mobile measuring instruments closely spaced. Continuous measurements are obtained with stationary automatic monitoring stations. Utilization of obtained data is discussed. J.M.S.

N82-20740 Eidgenoessische Technische Hochschule, Zurich (Switzerland). Lab. fuer Atmosphaerenphysik.
ACCURACY, REPRODUCTIBILITY AND VERTICAL RESOLUTION OF DATA FROM RADIOSONDE SYSTEMS
Hans Richner *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 42-45 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

In an intercomparison with three radiosonde systems, data on typical deviations and reproducibility of upper-air data were obtained. General remarks on the maximum obtainable vertical resolution are followed by a suggestion on how the ascent velocity of the balloon could be used to determine vertical winds. Author

N82-20741 Deutscher Wetterdienst, Hamburg (West Germany). Meteorologisches Obs.
THE RADIOMETRIC NETWORK OF THE GERMAN WEATHER FORECASTING SERVICE [DAS STRAHLUNGSMESSNETZ DES DEUTSCHEN WETTERDIENSTS]
H. D. Behr and F. Kasten *In its* Soc. Meteorol. Palatina, 1780-1795 1980 p 46-48 In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Radiometric stations established and operated for biometeorological and agricultural purposes are discussed. Data on time courses and frequency distributions at single stations and the horizontal field of global radiation are presented. J.M.S.

N82-20742 Deutscher Wetterdienst, Hohenpeissenberg (West Germany). Meteorologisches Obs.
ON THE POSSIBILITY OF MEASURING PRECIPITATION BY AREA [UEBER DIE MOEGLICHKEITEN, FLAECHENNIEDERSCHLAEGE ZU MESSEN]
W. Attmannspacher and J. Riedl *In its* Soc. Meteorol. Palatina, 1780-1795 1980 p 49-51 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The demands of precipitation measurement at specific points and over several areas can be solved in sufficient temporal resolution by modern equipment. Only a weather radar is able to give the real precipitation distribution over an area. The value of the weather radar information can be improved and made available for more users by a computer controlled compound of several radars. Author

N82-20743 Institut Royal Meteorologique de Belgique, Brussels.
THE HOMOGENEITY OF TEMPERATURE SERIES. THE SERIES OF THE AVERAGE EXTREME TEMPERATURES AT NOON AT BRUSSELS-UCCLE [SUR L'HOMOGENENEITE DES SERIES DE TEMPERATURE. LA SERIE DES EXTREMES MOYENS A MIDI A BRUXELLES-UCCLE]
R. Sneyers *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 52-53 refs In FRENCH (For primary document see N82-20732 11-47)
Avail: Issuing Activity

To provide uniformity in records of the average noon temperature in Belgium, atmospheric temperatures recorded at the Brussels Observatory from its opening in 1833 until 1900 were analyzed. Errors caused by the change of instrument location and of time of measurement (one minute before or one minute after noon) were corrected. These data were then statistically analyzed in order to fill in lacunae existing in records of atmospheric temperature measured at Uccle.Transl. by A.R.H.

N82-20744 Bundesgesundheitsamt, Berlin (West Germany). Inst. fuer Wasser-, Boden- und Lufthygiene.
THE QUANTIFICATION OF THE LOCAL VALUES OF WEATHER DEPENDENT MEASUREMENTS [ZUR QUANTIFIZIERUNG DER OERTLICHEN REPRAESENTANZ WETTERABHAENGIGER MESSUNGEN]
Walter Fett *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 54-56 ref In GERMAN; ENGLISH

summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Systematic influences of the environment affecting the representation of a station must be recognizable through the dependence on the wind direction of the measurement quantities concerned. Statistical parameters are derived from the dependence on the direction and are tested concerning their measure of representation particularly at stations of air surveillance. Accidental influences due only to one station in considerations are determined by means of an analysis of variance through synchronous measurements of a station triplet. For each station the local dispersion is indicated, independent of the common events. Significant statements about the representation of certain stations result from the application of this procedure to the measurement of temperature and dust in Berlin. Author

N82-20745 Deutscher Wetterdienst, Hamburg (West Germany). Meteorologisches Obs.

SUGGESTIONS FOR STANDARDIZED REDUCTION OF DATA FROM DIFFERENT NATIONAL SOLAR RADIATION NETWORKS [VORSCHLAG ZUR STANDARDISIERTEN REDUKTION DER DATEN VERSCHIEDENER NATIONALER HIMMELSSTRAHLUNGS-MESSNETZE]

Klaus Dehne *In its* Soc. Meteorol. Palatina, 1780-1795 1980 p 57-59 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

A technique for measuring diffuse solar radiation is described with emphasis on losses of data due to shading ring pyranometers. It is proposed to homogenize the diffuse solar radiation data obtained from various radiometric networks using different shading disks by reduction factors which are obtained by comparison to a standard shading disk device. J.M.S.

N82-20746 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Optoelektronik.

RANGEFINDER SYSTEM FOR SLANT RANGE VISIBILITY [WEGE ZUR NETZMAESSIGEN ERFASSUNG DER SCHRAEGSICHT]

Christian Werner *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 60-65 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Careful measurement of the slant range visibility is important for safe and regular aircraft landing operations. Measurements are necessary under visibility conditions lower than 1500 m up to an altitude of about 100 m. Many remote sensing methods are known to determine the slant range visibility. A modified laser rangefinder system which uses a simplified slope method is described. The accuracy of this 'Two-Point-Method' is analyzed for several atmospheric conditions. Measurements with a described prototype system are presented. J.M.S.

N82-20747 Karlsruhe Univ. (West Germany). Meteorologisches Inst.

THE MESOKLIP EXPERIMENT: COMPREHENSIVE VISUALIZATION OF MESOSCALE STRUCTURES [MESOKLIP - EIN EXPERIMENT ZUR ERFASSUNG MESOSKALIGER STRUKTUREN]

F. Fiedler *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 66-71 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Atmospheric conditions over complex terrain are considered including mesoscale processes and the derivation of empirical relationships for the treatment of small scale processes on sloping terrain. The experimental MESOKLIP which measured mesoscale phenomena occurring within a period of 14 days and obtained initial data sets for numerical mesoscale models and the means for their verification is described. Some mesoscale phenomena connected with orographic influences are discussed. An overview of the experiment and some results concerning the surface wind field are given. J.M.S.

N82-20748 Karlsruhe Univ. (West Germany). Meteorologisches Inst.

THE INFLUENCE OF CHARACTERISTIC TERRAIN STRUCTURES ON AIR FLOW AT THE EASTERN BORDER OF THE RHINE VALLEY [EINFLUSS CHARAKTERISTISCHER GELAENDESTRUKTUREN AUF DIE STROEMUNG AM OSTRAND DES OBERRHEINTALS]

Karl Hoeschele *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 72-73 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

In the model area of MESOKLIP the eastern border of Rhine valley has some typical structures with horizontal extensions in an order of magnitude of about 1 km. The effects of these comparatively small structures on the air flow are studied by means of a recordng network with 10 wind stations (6-8 m or 35 m above ground) near Karlsruhe. A similar network was installed in the center of the MESOKLIP area from the western to the eastern border of Rhine valley. The results of long time records and of single events reveal the large influence of the structured border on the air flow and the dependence of large scale conditions. Author

N82-20749 Technische Universitaet, Munich (West Germany). Meteorologisches Inst.

THERMAL INDUCTION AND DAILY WIND SYSTEMS AT THE SLOPE OF THE HAARDT DURING MESOKLIP [WAERMEHAUSHALT UND TAGESPERIODISCHE WINDSYSTEME AM HAARDTRAND WAEHREND MESOKLIP]

Barbara Hennemuth *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 75-77 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Daily wind systems at the slope of the Haardt are estimated using measurements made during the MESOKLIP experiment. The observed wind fields, however, are superpositions of the dynamically and thermally induced winds, where the direction to the slope is very important. Author

N82-20750 Karlsruhe Univ. (West Germany). Meteorologisches Inst.

TEMPERATURE INVERSIONS AT DIFFERENT PARTS OF THE UPPER RHINE VALLEY [TEMPERATURINVERSIONEN AN VERSCHIEDENEN ORTEN DES OBERRHEINTALES]

Gebhard Mast *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 79-81 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The temperature and wind fields of the atmospheric boundary layer during nights with strong radiation in the area of the Oberrheintal are investigated by means of experimental data, measured during the MESOKLIP experiment in September 1979. The analysis of the data shows a quick extension of the upper boundary of the surface inversion from 150 m to 400 m above ground. Correlated with this lifting of the inversion is a strong acceleration of the air in the direction of the valley, that causes the development of a low level jet. Author

N82-20751 Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Bioklimatologie.

PROBLEMS WITH THE CHARTING OF SURFACE ALBEDO IN A MESOSCALE AREA [PROBLEMATIK BEI DER KARTIERUNG DER OBSERFLAECHENALBEDO IN EINEM MESOSKALIGEN GEBEIT]

Helmut Mayer *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1981 p 82-84 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
(Contract DFG-MA-749/3)
Avail: Issuing Activity

The surface albedo was traced in the Upper Rhine valley based on topographical maps and values from the literature; the problems of this method are explained. J.M.S.

N82-20752 Deutscher Wetterdienst, Offenbach am Main (West Germany).

MEAN GEOSTROPHIC AND OBSERVED AIR FLOW CONDITIONS IN THE UPPER RHINE VALLEY [MITTLERE GEOSTROPHISCHE UND BEOBACHTERE STROEMUNGS-

VERHAELTNISSE IM OBERRHEINGRABEN]
H. Malberg, G. Boekens, and G. Frattesi *In its* Societas Meteorologia Palatina, 1780-1795 1980 p 85-88 In GERMAN (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Based on the data of four falls a comparison of different methods (triangle, regression, field analysis of pressure) is made to estimate the geostrophic wind. Then the relationship between surface and geostrophic wind in the upper Rhine valley is investigated and some orographic effects are discussed. Author

N82-20753 Mainz Univ. (West Germany). Inst. fuer Meteorologie.
THE INFLUENCE OF LARGE CITIES OF THE WINDFIELD [DER EINFLUSS GROSSER STADTGEBIETE AUF DAS WINDFELD]
Peter Martin Keuler *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 90-92 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

A dense net of meteorological stations in the area of Frankfurt/Main allowed investigations into the special effects of the city on larger wind fields. It was found that even during general calm weather conditions cities tend to generate an accelerated wind field. This leads to higher wind velocities in the city than in the surrounding environment. J.M.S.

N82-20754 Technische Hochschule, Hanover (West Germany). Inst. fuer Meteorologie und Klimatologie.
NOCTURNAL WINDSPEED MAXIMAL IN THE BOUNDARY LAYER OVER THE LOW PLAINS OF NORTHERN GERMANY [NAECHTLICHE WINDMAXIMA IN DER GRENZSCHICHT UEBER DER NORDDEUTSCHEN TIEFEBENE]
Christoph Kottmeier, Dieter Lege, and Rainer Roth *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 93-95 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

A case study is used to describe the development of a nocturnal jet. Composite profiles of temperature gradient, windshear, windspeed and Richardson number, constructed from 159 single profiles, show the typical vertical structure of the planetary boundary layer during the occurrence of low level jets. The prevailing synoptic conditions are described. Author

N82-20755 Amt fuer Wehrgeophysik, Porz-Wahn (West Germany).
SYNOPTICAL AND ENERGY BASED APPROACHES TO THE ORIGIN, INTENSIFICATION AND FORECASTING OF ROTATING THUNDERSTORMS [BEMERKUNGEN ZUR ENTSTEHUNG, INTENSIVIERUNG UND VORHERSAGE VON WIRBELSTUERMEN AUS SYNOPTISCHER UND ENERGETISCHER SICHT]
Dietwalt Fuchs *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 96-97 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Tornadoes develop like similar vortices over conflagrations and mainly in rotating thunderstorms. Additionally, strong positive vertical velocity shear, associated with vigorous updrafts in thundercloud clusters, generate strong horizontal velocity shear at their flanks, in which the typical subscale vortex form, recognizable as a hook-echo on the radar screen. Sudden circulation around an almost vertical axis leads to tremendous pressure fall by the effect of centrifugal forces. Therefore, a large product between instability energy and vertical velocity shear - increasing instability due to lifting by horizontal divergence and positive vorticity advection aloft must be considered, too - indicates tornadic situations. Author

N82-20756 Technische Hochschule, Hanover (West Germany). Inst. fuer Meteorologie und Klimatologie.
SIMULATION MODELS IN MESOSCALE METEOROLOGY [SIMULTATIONSMODELLE IN DER MESOSKALIGEN METEOROLOGIE]
D. Etling *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 98-105 refs In GERMAN (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The model characteristics of special problems in mesoscale modeling are discussed. Mesoscale meteorology deals with phenomena of a typical horizontal range of 20 km to 200 km. It is not detected by the short range models weather service's horizontal ranges of 300 km. The model scales of the convection model or boundary layer model only partially describe the mesoscales. The simulation model condenses the mesoscale phenomenon with its typical intermediate position between large areas and small areas of atmospheric movements. Application possibilities of mesoscale models are presented. Transl. by E.A.K.

N82-20757 Karlsruhe Univ. (West Germany). Meteorologisches Inst.
USE OF A NUMERICAL MODEL FOR THE AIRFLOW IN MESOSCALE TERRAIN [ANWENDUNGEN EINES NUMERISCHEN MODELLS FUER DIE UEBERSTROEMUNG MESOSKALIGER GALAENDEFORMEN]
Thomas Prenosil *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 106-108 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

A two dimensional numerical model which simulates the influence of mesoscale terrain on the atmospheric flow pattern is presented. Some of the predicted phenomena which arise from the simulation of the airflow over the Rhine valley and the German North Sea coast are verified by synoptic routine data. J.M.S.

N82-20758 Freie Univ., Berlin (West Germany). Inst. fuer Geophysikalische Wissenschaften.
FIRST DATA FROM A SIMULATION OF MESOSCALE WIND CONDITIONS IN THE GERMAN NORTH SEA COASTAL REGION USING THE UNIVERSITY OF VIRGINIA MESOSCALE MODEL (UVMM) WITH VERIFICATION THROUGH OBSERVATORIES [ERSTE ERGEBNISSE EINER SIMULATION DER MESOSKALIGEN WINDVERHAELTNISSE IM DEUTSCHEN NORDSEEKUESTENGEBEIT MIT DEM UNIVERSITY OF VIRGINIA MESOSCALE MODEL (UVMM) UND VERIFIKATION DURCH BEOBACHTUNGEN]
Lutz Blumhagen, Hans-Wilfried Jubelt, and Guenther Warnecke *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 109-111 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The University of Virginia Mesoscale Model was applied to the northwest German coastal region with a mesh interval of 8 km for a selection of undisturbed days (summers of 1976 and 1977) characterized by different homogeneous synoptic wind fields. The simulations were compared with hourly observations of the synoptic network and supplementary stations. In general, the model impressively exhibits the mesoscale influence of an irregular coastline on a homogeneous synoptic scale wind pattern, in good accordance with observations. During the verification process it became necessary to adapt the UVMM to the nonstationary wind conditions of the midlatitudes. Examples of simulation are presented and discussed in detail. Author

N82-20759 Technische Hochschule, Darmstadt (West Germany). Inst. fuer Meteorologie.
NUMERICAL SIMULATION OF LOCAL WIND SYSTEMS IN THE AREA OF AN ALPINE VALLEY [NUMERISCHE SIMULATION LOKALER WINDSYSTEME IM BEREICH EINES ALPENTALES]
Friedhelm Wallbaum *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 112-115 refs In GERMAN (For primary document see N82-20732 11-47)
Aval: Issuing Activity

The nonhydrostatic numerical model FITNAH 2 enables the calculation of atmospheric current and temperature fields of topographically distributed terrains. Geotropic wind and potential temperature on the level of higher boundary models are the dimensions applied to a flow simulation model. Results from a flow simulation in a mountain valley with specified soil temperatures are presented. Transl. by E.A.K.

N82-20760# Technische Universitaet, Munich (West Germany). Meteorologisches Inst.

THE THEORY OF THERMALLY INDUCED AIR CIRCULATION IN A VALLEY [ZUR THEORIE DER THERMISCH ANGEFACHTEN ZIRKULATION IN EINEM TAL]

Joseph Egger *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 116-117 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)

Avail: Issuing Activity

A simple three dimensional model based on the Boussinesq-equations for shallow convection is used to study the wind systems in a valley which are induced by the enhanced insolation at the valley's slopes. It is shown that the most conspicuous features of observed wind systems in a valley are simulated by the model. Author

N82-20761 Cologne Univ. (West Germany). Inst. fuer Geophysik und Meteorologie.

CALCULATION OF AIR FLOW AND LAYER CONDITIONS OF WESTERLY WINDS IN THE UPPER RHINE VALLEY [BERECHNUNG DER STROEMUNGS- UND SCHICHTUNGS-VERHAELTNISSE IM OBERRHEINGRABENBEI WESTWIND-LAGE]

W. Behnke *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 118-121 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)

Avail: Issuing Activity

Two different methods to compute eddy diffusivity K in a two dimensional, incompressible and hydrostatic planetary boundary model are tested in the case of an unstable planetary boundary layer. The temperature and wind profiles of both models are compared with the measurements made during MESOKLIP experiment. Both models agree well at its boundaries in x-direction where the area is horizontally homogeneous. As the airflow is affected by the orography in the upwind direction of the hills (Haardt) the differences between the two models become large. J.M.S.

N82-20762 Hochschule der Bundeswehr, Munich. (West Germany).

SIMULATION OF THE AIR FLOW OVER A HEATED ROUGH ISLAND [SIMULATION DER STROEMUNG UEBER EINER RAUHEN WAERMEINSEL]

Hans Wengle *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 122-124 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)

Avail: Issuing Activity

An urban area is assumed to be characterized by given distributions of surface roughness and surface heat flux. The effects of the nonhomogeneous boundary conditions are studied, in particular, the effects on the mean velocity field, on its turbulence structure, and on the transport of air pollutants in the range of influence of a heated rough island. To gain a first overview, a two dimensional formulation is used. The problem is solved numerically taking into account Coriolis and buoyancy forces, the distributions of potential temperature and humidity, the heat conduction in the soil, an energy balance at the soil/air interface, and the radiation. In addition, the atmospheric diffusion equation is solved to evaluate the effects of an urban area on the dispersion of air pollutants behind elevated sources. J.M.S.

N82-20763 Technische Hochschule, Darmstadt (West Germany). Inst. fuer Meteorologie.

THE NUMERICAL SINGLE SURFACE MESOSCALE SIMULATION MODEL STUTE [DAS MESOSKALAGE NUMERISCHE (EINFLAECHEN) SIMULATONSMODELL 'STUTE']

Hans Joachim Kirstein *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 125-127 refs In GERMAN (For primary document see N82-20732 11-47)

Avail: Issuing Activity

The mesoscale one dimensional boundary layer model STUTE, is discussed. The model simulates influences of orography, and heat and cold sources on the soil of surface wind and pressure distribution. It is shown that the model on location produces acceptable surface wind and pressure fields with desired orographic and temperature distribution. Transl. by E.A.K.

N82-20764 Freie Univ., Berlin (West Germany). Inst. fuer Geophysikalische Wissenschaften.

COMPARATIVE SIMULATION OF TOPOGRAPHIC INFLUENCES WITH NUMERICAL REGIONAL SCALE MODELS [VERGLEICHENDE SIMULATION TOPOGRAPHISCHER EFFEKTE MIT NUMERISCHEN REGIONALSCALEMODELLEN]

Dietrich Heimann, Hans-Wilfried Jubelt, and Felicitas Wilcke *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 128-130 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)

Avail: Issuing Activity

Exemplary comparisons of meteorological mesoscale simulations are introduced in respect to their results. The models reproduce topographic influences to the surface windfield with different accuracy due to their physical and mathematical structure. The comparison runs allow statements about the applicability of the models to characteristic meteorological situations and topographical features. Also computer requirements are considered. Three test areas are selected with dense wind measuring networks. Author

N82-20765 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.

LINEARIZED THEORY OF THE THREE DIMENSIONAL FLOW OVER HILLS IN THE MESOSCALE [LINEARE THEORIE DER DREIDIMENSIONALEN GEBIRGSUEBERSTROEMUNG IN MESOSCALE]

Franz Somieski *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 131-133 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)

Avail: Issuing Activity

The numerical model presented is linearized, three dimensional, and hydrostatic with baroclinic mean flow. The results show quasigeotrophic flow around a circular mountain with a characteristic diameter of 500 km. If the mountain diameter is reduced to 50 km, highly a geostrophic flow is observed. Two case studies simulating the flow over the Bavarian Hills yield shorter horizontal wavelengths than the analysis of surface pressure fields from the synoptic station network. Author

N82-20766 Karlsruhe Univ. (West Germany). Meteorologisches Inst.

TRAJECTORY CALCULATION IN MOUNTAINOUS TERRAIN UNDER INVERSION WEATHER CONDITIONS [TRAJEKTORIENBERECHNUNG IN GEBIRGIGEN GELAENDE BEI INVERSIONSWETTERLAGEN]

Hans-Joachim Koppert *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 134-136 refs In GERMAN, ENGLISH summary (For primary document see N82-20732 11-47)

Avail: Issuing Activity

The flow conditions occurring under strong temperature inversions in mountainous country are investigated. The problem is reduced to two dimensional by vertically averaging the three model equations (vorticity equation, continuity equation, definition of the vorticity). As an example of application the flow pattern and the trajectories for different heights of the inversion and different directions of the large scale wind are computed. J.M.S.

N82-20767 Karlsruhe Univ. (West Germany). Meteorologisches Inst.

NUMERICAL SIMULATIONS OF THE TRANSPORT PROCESSES ABOVE COMPLEX TERRAIN [NUMERISCHE SIMULATIONEN VON TRANSPORTVORGAENGEN IN INHOMOGENEM GELAENDE]

Gisela Tangermann-Dlugi *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 137-139 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)

Avail: Issuing Activity

A two dimensional, time dependent hydrostatic numerical model is used to simulate the air flow and the turbulent exchange process in an atmospheric boundary layer above complex terrain. The influence of the orography, the ground roughness, and a differential heating at the ground on the meteorological variables

is investigated. As an example for a transport process above irregular terrain the dispersion process of inert pollutants is examined. Author

N82-20768 Mainz Univ. (West Germany).
CALCULATION OF GLOBAL RADIATION ON INCLINED SURFACES [DIE BERECHNUNG DER GLOBALSTRAHLUNG AUF GENEIGTE EMPFANGSFLAECHEN]
W. G. Zdunkowski, R. C. Hanson (US Air Force), and R. M. Welch *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 140-142 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

A method is discussed which permits the transformation of diffuse solar radiation fluxes from a horizontal to an inclined surface of arbitrary orientation. Together with already existing transformation equations for the parallel solar fluxes the global radiation with respect to inclined surfaces can now be calculated. Since the determination of the diffuse radiative intensities with the Monte Carlo method is too costly, simplified expressions are used to calculate them. Author

N82-20769 Meteorological and Geoastrophysical Abstracts, Washington, D. C.
THE ROLE OF SCIENTIFIC SOCIETIES IN ESTABLISHING NATIONAL AND INTERNATIONAL METEOROLOGICAL NETWORKS
Malcom Rigby *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 143-148 refs (For primary document see N82-20732 11-47)
Avail: Issuing Activity

An overview of the contributions of scientific societies in the development of standard meteorological instruments, observational methods, and the establishment of national and international networks to determine the horizontal and vertical variations in climate and to record the weather is given. J.M.S.

N82-20770 Freie Univ., Berlin (West Germany).
THREE-DIMENSIONAL OBJECTIVE ANALYSES OF METEOROLOGICAL PARAMETERS USING RADIOSONDES AND MEASURING NETWORKS IN CENTRAL EUROPE [DREIDIMENSIONALE, OBJEKTIVE ANALYSE METEOROLOGISCHER PARAMETER UNTER AUSNUTZUNG DES RADIOSONDEN- UND BODENMESSNETZES IN ZENTRALEUROPA]
Eberhard Reimer *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 149-151 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Several meteorological parameters are analyzed by use of the optimum interpolation scheme. Potential temperature is chosen as vertical coordinate and the ground surface is added. By use of the data from the MESOKLIP program on September 1979 at the Oberrheingraben the analysis-scheme is demonstrated for horizontal grid resolutions of about 100 Km and 50 Km. Author

N82-20771 Bundesanstalt fuer Gewaesserkunde, Koblenz (West Germany).
WATER MANAGEMENT ASPECTS OF METEOROLOGICAL OBSERVATION [DAS METEOROLOGISCHE BEOBACHTUNGSNETZ AUS DER SICHT DER WASSERWIRTSCHAFT]
Hans-J. Liebscher *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 152-154 In GERMAN (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The employment of meteorological measurements in hydrology and water management are discussed. Two kinds of meteorological data are utilized: (1) the short time data for hydrological forecasting and control; and (2) data for later investigations and calculations necessary for water balance calculations. The data application is useful in planning, data interpretation, and transfer systems in the many aspects of hydrology and water management.
Transl. by E.A.K.

N82-20772 Deutscher Wetterdienst, Offenbach am Main (West Germany).
THE PRECIPITATION MEASURING NETWORK WITH TELECOMMUNICATION FACILITIES IN THE HIGH WATER PROTECTION ON THE RHINE PROJECT [DAS FERNMELDENDE NIEDERSCHLAGSMESSNETZ IM PROJEKT 'HOCHWASSERSCHUTZ AM RHEIN']
Karl Hoffmann *In its* Soc. Meteorol. Palatina, 1780-1795 1980 p 155-156 refs In GERMAN (For primary document see N82-20732 11-47)
Avail: Issuing Activity

An applied telecommunication precipitation measuring network was installed in the upper Rhine and Main area. Optimization of data links for the precipitation runoff model of the Rhine River is discussed. The measuring network, the reporting organization and the precipitation statistics are outlined.
Transl. by E.A.K.

N82-20773 Amt fuer Wehrgeophysik, Porz-Wahn (West Germany).
THE EFFECT OF ONSHORE AND OFFSHORE WINDS ON LIGHTNING FREQUENCY DISTRIBUTION IN SCHLESWIG-HOLSTEIN [EINFLUSS DER LAND-SEEWINDZIRKULATION AUF DIE VERTEILUNG DER GEWITTERHAEUFIGKEIT IN SCHLESWIG-HOLSTEIN]
Karl Krames *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 158-160 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Charts for the mean number of days with thunderstorm activity in Schleswig-Holstein are introduced. The principle correspondence of the isobronts between different periods of time as well as the close agreement with the results of the CIGRE-lightning counter seems to be proof for the proper approach to the problem. This is further supported by a synoptical view of the atmospheric, hydrospheric and lithospheric interaction phenomena along the coastline, which manifest themselves mainly by the stabilizing or destabilizing effect of onshore and offshore winds. Author

N82-20774 Amt fuer Wehrgeophysik, Porz-Wahn (West Germany).
THE HYPSOGRAPHIC CURVE USED IN TWO-DIMENSIONAL DISPLAY OF CLOUD HEIGHTS [DIE HYPSOGRAPHISCHE KURVE ALS HILFSMITTEL ZUR FLAECHENMAESSIGEN DARSTELLUNG VON WOLKENHOEHEN]
Karl Krames *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 161-163 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Contourlines show in two dimensional display the absolute or relative area for specific constant heights within a given sector. Plotting cloud heights and other relevant data, extracted from weather reports, provides an easy tool to decide on the possibility of low level flights. Author

N82-20775 Deutscher Wetterdienst, Offenbach am Main (West Germany). Abteilung Kimatologie.
DATA SOURCES FROM THE PERIOD BEFORE INSTRUMENTS WERE USED IN CLIMATE ANALYSIS OVER LONG PERIODS [QUELLEN DER VORINSTRUMENTELLEN EPOCHE ZUR GROSSRAEUMIGEN KLIMMAANALYSE]
Juergen Lamfuss *In its* Soc. Meteorol. Palatina, 1780-1795 1980 p 164-166 refs In GERMAN (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The extraordinary rich territory of weather observations and records in Central Europe from the preinstrumentation period (before 1700) are documented. The preserved documents show weather observations, interesting historical, and especially culturally historical aspects. An extensive insight in the temporary science of physics and the developmental history of meteorology in Central Europe are indicated. Transl. by E.A.K.

N82-20776 Bundesgesundheitsamt, Berlin (West Germany). Inst. fuer Wasser-, Boden- und Lufthygiene.
OPTIMAL NETWORK DENSITY FOR ATMOSPHERIC RECORDING [OPTIMALE NETZDICHTE FUER ATMOSPHAERISCHE BEOBACHTUNGEN. GRUNDLEGENDE BETRACHTUNGEN IHRER EXISTENZ UND ERMITTLUNG]
Walter Fett *In* Deutscher Wetterdienst Soc. Meteorol. Palatina,

1780-1795 1980 p 167-168 ref In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Statistical parameters are derived in a theoretical-statistical manner for space-correlated events. The procedure is applied to the case of heavy precipitation in a long range dense recording network and to cases of air pollution measurements in an urban network. J.M.S.

N82-20777 Amt fuer Wehrgeophysik, Porz-Wahn (West Germany).
DISTRIBUTION OF OBSERVATION STATIONS IN WEST GERMANY; THE SERIOUS PROBLEMS FOR REQUESTED FLIGHT WEATHER BRIEFINGS CAUSED BY CLOSURES AT NIGHT, ON SUNDAY AND ON PUBLIC HOLIDAYS [DIE RAEUMLICHE VERTEILUNG DER BEOBACHTUNGS-STATIONEN IN DER BUNDESREPUBLIK DEUTSCHLAND, IHRE NICHTBESETZUNG WAEHREND DER NACHT SOWIE AN SONN- UND FEIERTAGEN UND DIE DARAUS RESULTIERENDE PROBLEMATIK BEI VFR-BERATUNGEN]
Volkmar Kant *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 169-170 In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The reduction of observation weather stations during night, Sundays, and holidays causes problems for required flight weather briefings. The automatic weather stations provide unreliable information in critical weather conditions (when vision is approximately 5 km). It is proposed that in an optimal working air rescue the observation network should be consolidated at night, whereas at that moment two to three weather information stations are closed, which should be covering a large area. Transl. by E.A.K.

N82-20778 Osservatorio Ticinese, Locarno-Monti (Switzerland).
DIGITAL RADAR DATA USED IN THE SWISS WEATHER SERVICE [DIGITALE RADARBILDER IM SCHWEIZERISCHEN WETTERDIENST]
Juerg Joss *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 171-173 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Two weather radars became operational on La Dole (1675 m) close to Geneva and on Albis (893 m) close to Zurich. Each computer controlled radar scans every 10 minutes a full volume scan retaining the information of 19 antenna elevations up to a distance of 230 km and a height of 12 km. The computer calculates a three dimensional picture containing groundplan, front and sideview. A special algorithm is developed to take care of ground clutter an interpolation in dead zones. The results may be presented on color TV or on a facsimile recorder. The project treatment of digital satellite and radar data (DISAT) combines the data of the two radars and superimposes results from meteorological satellites and from automatic weather stations. E.A.K.

N82-20779 Technische Hochschule, Hanover (West Germany). Inst. fuer Meteorologie und Klimatologie.
WIND MEASUREMENTS FROM 50 M HIGH TOWERS IN THE NORTHERN GERMAN COASTAL REGION [WINDMESSUNGEN AN 50 M HOHEN TUERMEN IM NORDDEUTSCHEN KUESTENGEBIET]
G. Tetzlaff, R. Beyer, and H. Laude *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 174-176 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Wind profiles based on measurements with a network of six 46 m high towers in northern Germany are described. Wind measurement is only satisfactory if the relevant parameters, such as roughness length and stability are fully known as a function of wind direction and wind speed. Only then the error of extrapolated wind speed values is acceptable for application in wind energy. E.A.K.

N82-20780 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Optoelektronik.
TESTING THE TWO-POINT METHOD FOR STANDARD PERIPHERAL VISION DETERMINATION [EXPERIMENTELLE ERPROBUNG DES 2-PUNKTE-VERFAHRENS ZUR BESTIMMUNG DER SCHRAEGEN NORMSICHT]
Christian Werner *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 178-179 In GERMAN (For primary document see N82-20732 11-47)
Avail: Issuing Activity

A laser radar system was applied to prove a two point slope method in the widening of a laser range determination. Cloud height measurements were necessary in the analysis of possible stratification. It is possible by further time switch to suppress the first or second cloud echo and to measure more cloud layers. It is found that the inversion level can be determined by the two point slope method. Transl. by E.A.K.

N82-20781 Fraunhofer-Inst. fuer Atmosphaerische Umweltforschung, Garmisch-Partenkirchen (West Germany).
LIDAR SOUNDING OF DIURNAL VARIATION OF THE VERTICAL AEROSOL DISTRIBUTION OVER THE UPPER RHINE VALLEY [LIDAR-SONDIERUNG DES TAGESGANGES DER VERTIKALEN AEROSOLSCHICHTUNG UEBER DEM OBERRHEINGRABEN]
Walter Carnuth, Michael Littfass, and Rudolf Sladkovic *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 180-182 In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Radiosonde ascents and optical radar (lidar) soundings of the lower temperature troposphere in 694, 530 and 347 nm wavelength were performed. The diurnal variation of the vertical aerosol distribution measured on Sep. 27, 1979, between 6 AM and 9 PM is presented in 694 nm wavelength and correlated with simultaneous temperature and humidity profiles. E.A.K.

N82-20782 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Inst. fuer Physik der Atmosphaere.
SOUNDING THE AEROSOL DISTRIBUTION OVER THE UPPER RHINE VALLEY IN THE VALLEY IN THE SPEYER AREA BY MEANS OF LIDAR [SONDIERUNG DER AEROSOLSCHICHTUNG UEBER DEM OBERRHEINGRABEN IN RAUM SPEYER MITTELS FLUGZEUG-LIDAR]
P. Moerl, M. E. Reinhardt, W. Renger, and R. Schellhase *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 183-184 refs In GERMAN (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The aerosol lidar system on meteorological research airplanes is outlined. The sonde method makes the following observations: (1) soil measurements (smog layers with temperature boundary effects); (2) control of harmful material emission by large industrial complexes; (3) determination of fresh air flow course as an aid in construction planning; (4) precision sounding of smoke plumes; (5) sounding upper layers of clouds; and (6) fine structure and dynamic methods of aerosol stratification. Transl. by E.A.K.

N82-20783 Karlsruhe Univ. (West Germany). Meteorologisches Inst.
STRUCTURE OF TURBULENCE OVER THE UPPER RHINE VALLEY [TURBULENZSTRUKTUR UEBER DEM OBERRHEINGRABEN]
Thomas Hauf and Ulrich Corsmeier *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 186-188 refs In GERMAN; In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Turbulence measurements were made in the Rhine Valley with the research aircraft Falcon-Mystere. The influence of the Rhine Valley and the surrounding mountains on the convective structure of turbulence within the planetary boundary layer is discussed. E.A.K.

N82-20784 Karlsruhe Univ. (West Germany). Meteorologisches Inst.
VERTICAL PROFILE OF AIR FLOW IN THE UPPER RHINE VALLEY AND AT THE BORDER OF THE KREICHGAU

[VERTIKALPROFILE DER WINDRICHTUNG IM OBERRHEINTAL UND AM KRAICHGAURAND]
O. Walk *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 189-191 In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Wind flows in the Upper Rhine Valley and in a side valley are described by median and the 16% and 84% limits of wind direction. The wind direction profiles with altitudes obtained from tower measurements of different zones are outlined. E.A.K.

N82-20785 Technische Hochschule, Hanover (West Germany). Inst. fuer Meteorologie und Klimatologie.
DETERMINING SOIL HEAT FLUX [MESSUNGEN DES BODENWAERMESTROMS]
G. Tetzlaff and U. G. Matthias *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 192-194 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Factors affecting the measurement of soil heat flux are discussed. Soil properties such as density, thermal conductivity, and specific heat must be available for the determination of the soil heat flux. These parameters vary with time and space. Comparisons between measurements and model calculations show that the upper layers of the soil strongly influence the temperature beneath the soil surface and the heat flux. Vertically implanted temperature probes disturb the temperature field and cause errors in the temperature measurements. J.D.H.

N82-20786 Technische Universitaet, Munich (West Germany). Meteorologisches Inst.
MOUNTAIN WIND IN THE INN VALLEY [GEBIRGSWINDUNTERSUCHUNGEN IM INNTAL]
Carl Freytag *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 195-197 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Wind circulation in an Alpine valley was investigated. During an autumnal period of fine weather (October 1978) the energetics and dynamics of the wind circulation in the Inn Valley near Innsbruck were explored. Slope winds, mountain and valley winds, and antiwinds were considered. This circulation is represented in its diurnal variation. It differs in many ways from well-known schemes of mountainous winds, completing and improving them. J.D.H.

N82-20787 Technische Hochschule, Vienna (Austria).
THE AUSTRIAN HEAT ISLAND IN THE DANUBE AREA IN THE REGION OF KAISER JOSEPH THE SECOND [DIE WAERMEINSEL DES OESTERREICHISCHEN DONAURAUMES ZUR REGIERUNGSZEIT KAISER JOSEPHS 2]
Friedrich Lauscher *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 199-200 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The average temperature in the Austrian lowlands during 1780-1790 are considered in relation to European temperatures since the 17th century. Temperatures in twenty two European locations are considered, and temperature deviations between the 1781-1790 average and the two hundred year average between 1780-1979, and between the 1971-1979 average are compared with the two hundred year average. J.D.H.

N82-20788 Amt fuer Wehrgeophysik, Porz-Wahn (West Germany).
GEOMAR: DIFFUSION EXPERIMENTS AT SEA [GEOMAR: AUSBREITUNGSEXPERIMENTE UEBER SEE]
Arno Groll and Welfhart aufmKampe *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 201-203 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Diffusion experiments conducted at sea as part of the GEOMAR project (GEOphysical program for MARitime regions) from 1978 to 1980 are discussed. So far four campaigns have taken place in different seasons with an average duration of 12 days each. The tracers used were smoke, sulfur hexafluoride, and copper doped zinc sulfide particles. Concentration profiles were made at various distances from the source using different measuring techniques. Corresponding meteorological data were gathered by 49 surface synoptic stations and nine aerological stations. The evaluation procedure is described and preliminary results based on statistical diffusion theories are presented. J.D.H.

N82-20789 Amt fuer Wehrgeophysik, Porz-Wahn (West Germany).
GEOMAR: RADAR PROPAGATION OVER THE SEA [GEOMAR: RADARAUSBREITUNG UEBER SEE]
Karl-Erdmann Fischer *In* Deutscher Wetterdienst Soc. Meterol. Palatina, 1780-1795 1980 p 204-206 In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Investigations on radar propagation over sea were conducted as part of the GEOMAR project. Most of the time the distribution of temperature and humidity in the boundary layer over seas cause a duct for radar-rays (evaporation duct). An attempt to find a relation between duct height and ship routine weather observations is presented. In the presence of elevated ducts in the free atmosphere radar propagation is not sufficiently described by the evaporation duct concept. J.D.H.

N82-20790 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
INFLUENCE OF TERRAIN ON THE FORMATION AND SHAPE OF CONVECTION CLOUDS IN SATELLITE IMAGERY [DER EINFLUSS DES UNTERGRUNDES AUF AUSBILDUNG UND FORM DER KONVEKTIONSBEWOELKUNG IN SATELLITENAUFNAHMEN]
Matthias Eckardt *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 207-209 In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The investigation of mesoscale phenomena using satellite imagery is evaluated. Typical examples are the formation of vortex streets on the leeward side of ocean islands, the lee-effect of southern Norway on shower activity in northern Germany, and the suppression of convection when air is streaming over cold water surfaces. Satellite images were compared with low level flow and temperature distribution, and radar and precipitation maps. It is determined that conventional network density is not sufficient for studying mesoscale phenomena as seen in high resolution satellite pictures. J.D.H.

N82-20791 Technische Hochschule, Darmstadt (West Germany). Inst. fuer Meteorologie.
MESOSCALE MODELS: CALCULATION OF DIFFERENT MODEL STRUCTURES [MESOSCALE-MODELLE: AUSWIRKUNGEN VERSCHIEDENER MODELLANAHMEN]
F. Wippermann *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 210-212 refs In GERMAN (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The calculations of several mesoscale models on the vertical structure of meteorological fields were examined. The equation which describes the atmospheric occurrence is linearized. The observation of the vertical occurrence only reduces the problems of interference dimension to a two dimensional flow.
Transl. by E.A.K.

N82-20792 Deutscher Wetterdienst, Offenbach am Main (West Germany).
DEVELOPMENT OF A REGIONAL WEATHER FORECASTING MODEL [AUFBAU EINES REGIONALEN WETTERVORHERSAGEMODELLS]
Eberhard Mueller *In its* Soc. Meteorol. Palatina, 1780-1795 1980 p 213-215 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

To improve regional and local weather forecasts a limited area model with a horizontal grid size of about 50 km and 18 layers in the vertical is being developed. Special emphasis is placed upon the boundary layer, the hydrologic cycle including moist convection, and the initialization. The physical and numerical

structure of the model and experiments using a channel version are outlined. Author

N82-20793 Deutscher Wetterdienst, Offenbach am Main (West Germany).
INITIALIZATION OF REGIONAL WEATHER FORECASTING MODELS [INITIALISIERUNG VON REGIONALEN WETTERVORHERSAGEMODELLEN]
Werner Wergen *In its* Soc. Meteorol. Palatina, 1780-1795 1980 p 216-218 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Several techniques of initializing fine mesh prediction models are examined. The normal mode procedure is more efficient and economic than static or dynamic initialization. In this method the observed fields are expanded using the eigenfunctions of the linearized model, which allows a separation into meteorological and noise amplitudes. An explicit relationship between the amplitudes of the mass and wind fields is formulated to suppress the unwanted high frequency oscillations. The nonlinear terms are treated iteratively. A high resolution (18 levels, grid length 63.5 km) model including steep orography is presented. E.A.K.

N82-20794 Technische Hochschule, Darmstadt (West Germany).
MODEL CALCULATION OF DAILY FLOW VARIATION OVER A MEDIUM HEIGHT MOUNTAIN RANGE [MODELLRECHUNGEN ZUR TAGESVARIATION IN DER UEBERSTROEMUNG EINER MITTELGEBIRGSKETTE]
Guenter Gross *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 219-221 ref In GERMAN (For primary document see N82-20732 11-47)
Avail: Issuing Activity

A two dimensional hydrostatic version of the mesoscale model FITNAH 2 was used to simulate drainage patterns of a mountain chain. The model is transformed into an underground adjusted coordinate system. The potential temperature is determined under boundary conditions produced by the soil energy flow balance. The total energy flow in the soil disappears. It is found that it is possible in the calculation to allow for a large number of synoptic dimensions and standard parameters. Transl. by E.A.K.

N82-20795 Technische Hochschule, Darmstadt (West Germany). Inst. fuer Meteorologie.
MODEL CALCULATION OF STATIONARY FLOW OVER MOUNTAINS [MODELLRECHNUNGEN ZUR STATIONAEREN UEBERSTROEMUNG VON BERGEN]
Michael Buchhold *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 222-224 refs In GERMAN (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The flooding of mountainous and graded terrain in stabile stratification proportions was simulated with a two dimensional nonhydrostatic model. The influence of thermal stratification, wind speed, soil temperature and the slopefall on the formation or structure of the lee sources and circulations is studied.
Transl. by E.A.K.

N82-20796 Max-Planck-Institut fuer Meteorologie, Hamburg (West Germany).
NUMERICAL MODELS OF INHOMOGENEOUS PLANETARY BOUNDARY LAYER [NUMERISCHE MODELLIERUNG INHOMOGENER PLANETARISCHER GRENZSCHICHTEN]
Juergen Fischer *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 226-228 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

A planetary boundary layer model was used to investigate the influence of a hill valley configuration on the surface currents. Over the hill the deviation of the surface wind from the geostrophic wind as well as the increasing Reynolds-stress appears to depend on the roughness length and the inclination of the hills. The conditions of a Prandtl layer no longer hold in the valley. E.A.K.

N82-20797 Mainz Univ. (West Germany). Inst. fuer Meteorologie.
MODEL CALCULATION OF HEATING RATES IN THE URBAN-RURAL ATMOSPHERIC BOUNDARY LAYER CAUSED BY HORIZONTAL LONGWAVE RADIATION FLUX [MODELLRECHNUNGEN ZUR BESTIMMUNG DER ERWAERMUNGSRATEN IM BEREICH DER STADTRANDATMOSPHAERE AUFGRAND HORIZONTALER, LANGWELLIGER STRAHLUNGSSTROEME]
Dieter Burkat *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 229-231 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The heating rates caused by horizontal longwave radiation fluxes in the nonhomogeneous urban rural atmospheric boundary region were calculated by a nonspectral radiation model. The temperature and watervapor profiles represent an average summer and winter situation. The heating rates amount up to 1.1 K/d near the surface and on the rural side of the boundary region. Cooling rates of the same amount are observed on the adjoining urban side. E.A.K.

N82-20798 Kernforschungszentrum, Karlsruhe (West Germany). Abt. fuer Angewandte Systemanalyse.
DETERMINING THE PHI M(ZETA) AND THE PHI H(ZETA) FUNCTIONS IN THE PRANDTL LAYER
Gesa Neumann, Thomas Hauf (Karlsruhe Univ., West Germany), G. Neumann, and T. Hauf (Karlsruhe Univ., West Germany) *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 232-234 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

Wind and temperature profiles and the turbulent fluxes were measured over a wide range of stability conditions. The Monin-Obukhov functions phi M (zeta) and phi H (zeta) were determined. Different interpolation formula was adjusted to wind and temperature profiles which lead to different Monin-Obukhov functions. The von Karman's constant is found to be 0.35, however, the dimensionless temperature gradient phi H is 1.0 which is in contrast to Businger, who found 0.74 under neutral conditions.
E.A.K.

N82-20799 Deutscher Wetterdienst, Seewetteramt (West Germany).
WIND MEASUREMENT IN THE MARINE BOUNDARY LAYER [WINDMESSUNG IN DER MARITIMEN GRENZSCHICHT]
G. Oldbrueck *In its* Soc. Meteorol. Palatina, 1780-1795 1980 p 235-237 ref In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)
Avail: Issuing Activity

During the Atlantic Expedition GATE 74 an aerological measuring system was utilized to compute wind observations by navigational systems like OMEGA and LORAN-C. The quality factor of these wind measurements is very high in LORAN areas, and the aerological soundings on board FS Meteor during JASIN 78 are used to indicate the thermodynamic and kinematic structure of the marine boundary layer in the temperate latitudes. E.A.K.

N82-20800 Karlsruhe Univ. (West Germany). Meteorologisches Inst.
SPECTRAL ANALYSIS IN CLIMATOLOGICAL EMISSIVITY MEASUREMENTS IN THE UPPER RHINE VALLEY [SPEKTRANALYSE IMMISSIONSKLIMATOLOGISCHER MESSUNGEN IM OBERRHEINTAL]
C.-J. Richter and D. Ahrens *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 (date) p 238-240 refs In GERMAN Prepared in cooperation with Landesanstalt fuer Umweltschutz, Baden-Wuerttemberg, West Germany (For primary document see N82-20732 11-47)
Avail: Issuing Activity

The ozone layers and its relationship to global radiation were measured. Variations, coherence, and phase spectra of the time sequence were calculated over periods from 1 hour to 33 days. Typical time shifting between the patterns of both dimensions are noted. The connection of separation between lower and higher frequency fluctuation is examined. Transl. by E.A.K.

N82-20801 Mainz Univ. (West Germany). Inst. fuer Meteorologie.
LONGWAVE ATMOSPHERIC RADIATIVE FLUX WITH

RESPECT TO CLOUDS WHICH ARE GRAY BODY EMITTANTS AND BY PARTIAL CLOUDINESS [LANGWELLIGE STRAHLUNGSFLUESSE IN DER ATMOSPHAERE UNTER BERUECKSICHTIGUNG VON GRAUSTRAHLENDEN WOLKEN MIT PARTIELLER BEDECKUNG]

Walter-Georg Panhans *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 243-245 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)

Avail: Issuing Activity

The Elsasser Zdunkowski emissivity method to determine atmospheric radiative fluxes in the long wave spectrum outside the water vapor window, which is already extended to partial cloudiness, is also extended to clouds which are no longer black body emittants. The method introduces a flux transmission function for running water. The radiative divergences at the tops and bases and in the interior of thin clouds are much more realistic than those which result from the conventional hypothesis which calculates clouds as black bodies. E.A.K.

N82-20802 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.

DUST FROM THE SAHARA IN SATELLITE IMAGES [SAHARASTAUB IM SATELLITENBILD]

Ute Katergiannakis *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 246-248 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)

Avail: Issuing Activity

In satellite images of North Africa and the surrounding seas visibility is often obscured by sand and dust. This cloudiness appears in images of visible targets as a fine, light grey screen, which is probably a cirrostratus cloud. In infrared images sand and dust storms are seldom observed. Images of a dust wall in the inner Sahara desert, a sandstorm over the Mediterranean, and a dust cloud over the Atlantic ocean are shown. E.A.K.

N82-20803 Johann-Wolfgang-Goethe-Universitat, Frankfurt am Main (West Germany). Inst. fuer Meteorologie und Geophysik.

THE ERUPTION OF THE MOUNT ST. HELENS VOLCANO: EVIDENCE OF A STRATOSPHERIC SMOKE CLOUD OVER EUROPE [ERUPTION DES VULKANS MOUNT ST. HELENS: NACHWEIS DER STRATOSPHAERISCHEN RAUCHFAHNE UEBER EUROPA]

F. X. Meixner, H.-W. Georgii, and G. Ockelmann *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 249-251 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)

Avail: Issuing Activity

The eruption of the Mount St. Helens on May 18, 1980, emitted large amounts of gaseous and particulate material into the stratosphere (up to 23 km). The stratospheric eruption cloud was rapidly transported to the east and was observed on May 21, over Eastern US/Canada. The further transport over the Atlantic was estimated by first guess trajectory constructions. On May 26, several air samples were taken during an aircraft ascent (up to 13.7 km) over South Scandinavia. In contrast to an ascent on May 24 a 10 to 12 fold increase in sulfur dioxide mixing ratio was observed at tropopause level. E.A.K.

N82-20804 Karlsruhe Univ. (West Germany). Inst. Wasserbau3.

EXPERIMENTS WHICH DETERMINE THE INFLUENCE OF SURFACE TEMPERATURE ON EVAPORATION ON A SOLID SURFACE [EXPERIMENTELLE UNTERSUCHUNG ZUM EINFLUSS DER OBERFLAECHENTEMPERATUR AUF DIE VERDUNSTUNG AN EINER FESTEN OBERFLAECHEN]

Arnold Schuler *In* Deutscher Wetterdienst Soc. Meteorol. Palatina, 1780-1795 1980 p 252-254 refs In GERMAN; ENGLISH summary (For primary document see N82-20732 11-47)

Avail: Issuing Activity

The correlations between the flux coefficient used in Dalton's formula and the conditions in the boundary layer were studied. In nature parameters, such as the Reynolds number Re sub o cannot be calculated without avoiding large errors. These terms represent the substrate processes as well as the influence of the surface temperature. Good correlations must exist with the Stanton number. The application of this approach is presented. E.A.K.

N82-20805*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ATMOSPHERIC ENVIRONMENT FOR SPACE SHUTTLE (STS-2) LAUNCH

D. L. Johnson and S. C. Brown Dec. 1981 51 p refs

(NASA-TM-82463; NAS 1.15:82463) Avail: NTIS HC A04/MF A01 CSCL 04B

Selected atmospheric conditions observed near Space Shuttle STS-2 launch time on November 12, 1981, or Kennedy Space Center, Florida are summarized. Values of ambient pressure, temperature, moisture, ground winds, visual observations (cloud), and winds aloft are included. The sequence of prelaunch Jimsphere measured vertical wind profiles is given in this report. Wind and thermodynamic parameters measured at the surface and aloft in the SRB descent/impact ocean area are also presented. Final meteorological tapes, which consist of wind and thermodynamic parameters versus altitude, for STS-2 vehicle ascent and SRB descent have been constructed. The STS-2 ascent meteorological data tape was constructed. N.W.

N82-20806*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ATMOSPHERIC OBSERVATIONS FOR STS-2 LANDING

Robert E. Turner, James E. Arnold, and Gregory S. Wilson Dec. 1981 37 p refs

(NASA-TM-82464; NAS 1.15:82464) Avail: NTIS HC A03/MF A01 CSCL 04B

A summary of synoptic weather conditions existing over the western United States is given for the time of Shuttle descent into Edwards Air Force Base, California. The techniques and methods used to furnish synoptic atmospheric data at the surface and aloft for flight verification of the STS-2 Orbiter during its descent into Edwards Air Force Base are specified. Examples of the upper-level data set are given. N.W.

N82-20807*# Morgan State Univ., Baltimore, Md. Dept. of Mathematics and Computer Science.

ASSESSMENT OF THE QUALITY OF GATE AREA RAINFALL DATA FROM A NIMBUS-5 RADIOMETER Final Report

Nathaniel Knox 31 Mar. 1982 18 p refs

(Grant NAG5-14)

(NASA-CR-168512; NAS 1.26:168512) Avail: NTIS HC A02/MF A01 CSCL 04B

The quality of rainfall intensity estimates derived from passive microwave measurements by the Electrically Scanned Microwave Radiometer (ESMR-5) aboard the NIMBUS-5 satellite was evaluated. The microwave measurements used are those coincident with the GARP (Global Atmospheric Research Program) Atlantic Tropical Experiment (GATE). ESMR-5 derived rainfall intensity estimates are compared with hourly averaged GATE radar rainfall measurements. Using the radar measurements as ground truth it is determined that with the transfer curve derived herein the ratio (ESMR-5 derived rain rate)/radar measured rain rate has a mean of approximately 0.62. Author

N82-20808*# EG & G Washington Analytical Services Center, Inc., Riverdale, Md.

CTRANS: A MONTE CARLO PROGRAM FOR RADIATIVE TRANSFER IN PLANE PARALLEL ATMOSPHERES WITH IMBEDDED FINITE CLOUDS: DEVELOPMENT, TESTING AND USER'S GUIDE

8 Dec. 1976 203 p refs

(Contract NAS5-20857)

(NASA-CR-166759; NAS 1.26:166759; Rep-006-76) Avail: NTIS HC A10/MF A01 CSCL 04B

The program called CTRANS is described which was designed to perform radiative transfer computations in an atmosphere with horizontal inhomogeneities (clouds). Since the atmosphere-ground system was to be richly detailed, the Monte Carlo method was employed. This means that results are obtained through direct modeling of the physical process of radiative transport. The effects of atmosphere or ground albedo pattern detail are essentially built up from their impact upon the transport of individual photons. The CTRANS program actually tracks the photons backwards through the atmosphere, initiating them at a receiver and following

them backwards along their path to the Sun. The pattern of incident photons generated through backwards tracking automatically reflects the importance to the receiver of each region of the sky. Further, through backwards tracking, the impact of the finite field of view of the receiver and variations in its response over the field of view can be directly simulated. M.G.

N82-20809*# Computer Sciences Corp., Silver Spring, Md. System Sciences Div.
LANGLEY ATMOSPHERIC INFORMATION RETRIEVAL SYSTEM (LAIRS): SYSTEM DESCRIPTION AND USER'S GUIDE Final Report
D. E. Boland, Jr. and Taesul Lee Mar. 1982 240 p refs
(Contract NAS1-16412)
(NASA-CR-3529; NAS 1.26:3529; CSC/SD-81/6114) Avail: NTIS HC A11/MF A01 CSCL 04B

This document presents the user's guide, system description, and mathematical specifications for the Langley Atmospheric Information Retrieval System (LAIRS). It also includes a description of an optimal procedure for operational use of LAIRS. The primary objective of the LAIRS Program is to make it possible to obtain accurate estimates of atmospheric pressure, density, temperature, and winds along Shuttle reentry trajectories for use in postflight data reduction. Author

N82-20810# Naval Oceanography Command Center/Joint Typhoon Warning Center, FPO San Francisco, Calif.
FORECASTING INTENSE TROPICAL CYCLONES USING 700-mb EQUIVALENT POTENTIAL TEMPERATURE AND CENTRAL SEA-LEVEL PRESSURE
George M. Dunnavan Aug. 1981 15 p refs
(AD-A109335; NOCC/JTWC-TN-81-1) Avail: NTIS HC A02/MF A01 CSCL 04/2

Sikora (1976), et al., suggests that the equivalent potential temperature at 700 mb in a developing tropical cyclone is an excellent parameter to measure the total thermodynamic energy of the tropical cyclone at a particular time. It further is suggested that abnormally high values of equivalent potential temperature (> or = 370 K) can herald a period of subsequent explosive deepening. This note expands on that idea to propose a technique for forecasting the development of intense tropical cyclones (minimum sea-level pressure < 925 mb) based on the relationship of the total thermodynamic field, as measured by the tropical cyclone's central 700-mb equivalent potential temperature, and the kinematic field, as measured by the tropical cyclone's central sea-level pressure. One hundred seven tropical cyclones which occurred in the north Western Pacific and north Central Pacific Ocean were evaluated using 700-mb temperature, 700-mb dewpoint and sea-level pressure data which were available from past Annual Typhoon Reports (1975-1980). These data were used to develop a forecast technique whereby the tropical cyclone forecaster may anticipate significant development in a tropical cyclone by monitoring the central sea-level pressure and 700-mb equivalent potential temperature provided by aircraft reconnaissance. Author (GRA)

N82-20811# Systems Control, Inc., West Palm Beach, Fla.
WEATHER DETERIORATION MODELS APPLIED TO ALTERNATE AIRPORT CRITERIA Final Report
Edwin D. McConkey Sep. 1981 103 p
(Contract DOT-FA79NA-6029)
(AD-A108877; FAA-RD-81-92) Avail: NTIS HC A06/MF A01 CSCL 04/2

Flights under Instrument Flight Rules (IFR) require the filing of a flight plan. The flight plan must contain an alternate airport unless certain conditions at the destination are met. These conditions concern the availability of an instrument approach procedure and anticipated meteorological conditions within one hour of the estimated arrival time. Certain other conditions must be met for an airport to qualify as an alternate airport. These conditions also are based on instrument approach procedure availability and forecast meteorological conditions. Relaxation of the current requirements regarding alternate airports could benefit some aircraft operators by improving schedule reliability and reducing the number of weather related departure delays. The investigation quantified the increased risk of ceilings and visibilities being below landing minimums at several cities in the conterminous U.S. if requirements are relaxed. The study methods utilized climatology data and weather deterioration models to calculate the probability of an airport being below precision and non-precision approach minimums. Author (GRA)

N82-20812# Air Force Environmental Technical Applications Center, Scott AFB, Ill.
WORLDWIDE PARADROP CLIMATOLOGY: NORTH AMERICA, HAWAIIAN ISLANDS, AND LATIN AMERICA Final Report
Robert S. Noonan, Jr. Nov. 1981 431 p
(AD-A109870; USAFETAC/DS-81/097) Avail: NTIS HC A19/MF A01 CSCL 04/2

This study gives probability of occurrence of simultaneous ceiling (cig), visibility (vsby), surface and/wind classes for the following paradrop types at selected worldwide locations: (1) High altitude Low Opening/Military Freefall: Cig 2500 ft or higher, vsby 5 mi (8000 m) or greater, winds 13 kt or less. (2) Personnel and Container Delivery System: Cig 1500 ft or higher, vsby 3 mi (4800 m) or greater, winds 13 kt or less. (3) Equipment: Cig and vsby as in (2), winds 17 kt or less. (4) Container Delivery System: Cig and vsby as in (2), winds 20 kt or less. (5) Training Bunles: Cig and vsby as in (2), winds 25 kt or less. Winds include gusts. Author (GRA)

N82-20813# Naval Oceanography Command Center/Joint Typhoon Warning Center, FPO San Francisco, Calif.
A STUDY OF RECURVING TROPICAL CYCLONES > OR = 34kt (18 M/SEC) IN THE NORTHWEST PACIFIC 1970-1979
Jack E. Huntley 23 Dec. 1981 24 p refs
(AD-A109581; NOCC/JTWC-TN-81-2) Avail: NTIS HC A02/MF A01 CSCL 04/2

Recurving tropical cyclones in the Northwest Pacific region were studied to observe their behavior relative to track and intensity. Tropical cyclones occurring from 1970 through 1979 were selected for this study and categorized into three groups based upon their maximum intensity. Parameters relating to point to recurvature, direction and speed of movement, and intensity were analyzed. The skill of forecasting speed of movement by a solution to a first order differential equation was investigated. GRA

N82-20814# Aerodyne Research, Inc., Bedford, Mass.
FALLING SNOW OPTICAL MODELING
Manuel Martinez-Sanchez, David S. Dvore, John F. Ebersole, Roberto Vaglio-Laurin, and Thomas E. Spaulding White Sands Missile Range, N.M. Atmospheric Sciences Lab. Nov. 1981 66 p refs
(Contract DAAD07-81-C-0009)
(AD-A109736; ERADCOM/ASL-CR-81-0009-1) Avail: NTIS HC A04/MF A01 CSCL 04/2

In order to develop a model describing the adverse weather effects of snow on optical transmission, it is necessary to incorporate optical, physical, and meteorological characteristics. Report is on the development of a model which incorporates these three aspects of snow characterization. A numerical model aimed at obtaining an understanding of the meteorological aspects of snowfall is discussed. Specifically, the model accepts as inputs such measurable quantities as temperature and dew point vertical profiles, as well as other quantities, often not measured, such as updraft velocity, cloud droplet size, and ice nucleus concentration. Based on these data, the model then predicts the time evolution of the cloud, and, eventually, the rate of precipitation and the type of snow particles arriving at the ground. Optical considerations in order to provide a framework in which physical and meteorological aspects can be included are discussed. Specifically, the need for areal, volume, and settling velocity parameters in calculating optical extinction coefficients are discussed. Author (GRA)

N82-20815# Naval Postgraduate School, Monterey, Calif.
A STATISTICAL ANALYSIS OF DAILY AND WEEKLY RAINFALL FOR THE MONTEREY PENINSULA IN CENTRAL CALIFORNIA M.S. Thesis
Davut Kirca Sep. 1981 223 p refs
(AD-A109525) Avail: NTIS HC A10/MF A01 CSCL 04/2

This thesis presents a preliminary statistical analysis of the daily and weekly rainfall for the Monterey Peninsula, in central

California. The analysis begins by examining the daily rainfall data, also the relationship among the length of the storms, amount of rainfall in the storms and length of the successive days of rain. Also included is a study of the distribution of the amount of rainfall in the storms. Also study of the distribution was carried out for non-zero weekly rainfalls. 4x4 contingency tables are used to identify dependence/independence among the weeks in a given month. Also, 2x2 contingency tables are used to examine dependencies between weekly rainfalls; logistic analysis is used as a parameteric model for dependence. This paper attempts to analyze rainfall data in the statistical sense. No attempt is made to provide a physical explanation of the findings from the point of view of a meteorologist. Author (GRA)

N82-20816# Naval Postgraduate School, Monterey, Calif. Environmental Physical Group.

COMPARISON OF OVERWATER STABILITY CLASSIFICATION SCHEMES WITH MEASURED WIND DIRECTION VARIABILITY

G. E. Schacher, D. E. Spiel, K. L. Davidson, and C. W. Fairall 1982 61 p refs

(AD-A109577; NPS61-82-002) Avail: NTIS HC A04/MF A01 CSCL 04/2

Schemes for assessing atmospheric stability are described and a modification to the Pasquill scheme to parameterize it for the overwater regime is developed. The various schemes are compared to measured values of the wind direction standard deviation. The results are location specific, applying only to the California channel islands area. Author (GRA)

N82-20817# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

WORLDWIDE PARADROP CLIMATOLOGY: USSR, ASIA, AND AFRICA Final Report

Robert S. Noonan, Jr. Nov. 1981 664 p refs

(AD-A109872; AD-E850107; USAFETAC/DS-81/099) Avail: NTIS HC A99/MF A01 CSCL 04/2

This study gives probability of occurrence of simultaneous ceiling (cig), visibility (vsby), surface and/wind classes for the following paradrop types at selected African and Asia locations: (1) High altitude Low Opening/Military Freefall: Cig 2500 ft or higher, vsby 5 mi (8000 m) or greater, winds 13 kt or less. (2) Personnel and Container Delivery system: Cig 1500 ft or higher, vsby 3 mi (4800 m) or greater, winds 13 kt or less. (3) Equipment: Cig and vsby as in 2), winds 17 kt or less. (4) Container Delivery System: Cig and vsby as in 2), winds 20 kt or less. (5) Training Bundles; Cig and vsby as in 2), winds 25 kt or less. Winds include gusts. GRA

N82-20818# Air Force Environmental Technical Applications Center, Scott AFB, Ill.

WORLDWIDE PARADROP CLIMATOLOGY: EUROPE Final Report

Robert S. Noonan, Jr. Nov. 1981 450 p refs

(AD-A109871; AD-E850106; USAFETAC/DS-81/098) Avail: NTIS HC A19/MF A01 CSCL 04/2

This study gives probability of occurrence of simultaneous ceiling (cig), visibility (vsby), surface and/wind classes for the following paradrop types at selected worldwide locations: (1) High altitude Low Opening/Military Freefall: Cig 2500 ft or higher, vsby 5 mi (8000 m) or greater, winds 13 kt or less; (2) Personnel and Container Delivery System: Cig 1500 ft or higher, vsby 3 mi (4800 m) or greater, winds 13 kt or less; (3) Equipment: Cig and vsby as in 2), winds 17 kt or less; (4) Container Delivery System: Cig and vsby as in 2), winds 20 kt or less; and (5) Training bundles: Cig and vsby as in 2), winds 25 kt or less. Winds include gusts. GRA

N82-20819# Air Force Geophysics Lab., Hanscom AFB, Mass.

SNOWFALL RATES OBTAINED FROM RADAR REFLECTIVITY WITHIN A 50 km RANGE Environmental Research Papers

Roland J. Boucher 15 Sep. 1981 26 p refs

(AF Proj. 6670)

(AD-A109805; AFGL-TR-81-0265; AFGL-ERP-75) Avail: NTIS HC A03/MF A01 CSCL 04/2

The snowy winter of 1978 in Massachusetts allowed five opportunities to test the dependability of a CPS-9, 3.2 cm radar to determine snowfall rate and total snowfall accumulation at up to seven measuring sites within 50 km of the radar. Spaced at intervals of 0.5 to 1 hour, 166 snowfall rate measurements yielded a correlation coefficient of 0.88. However, in correlating the total storm snowfall, the amount of radar measured snowfall above a reference snowfall measurement site was made equal to the snowfall actually measured at this location. This calibration technique improved the storm snowfall correlation coefficient to 0.96. GRA

N82-20820# Air Force Geophysics Lab., Hanscom AFB, Mass.

VARIATIONS OF DENSITY AND WIND WITH TIME AT ALTITUDES 30-60 km

Arthur J. Kantor and Allen E. Cole 22 Sep. 1981 25 p refs

(AD-A109804; AFGL-TR-81-0281) Avail: NTIS HC A02/MF A01 CSCL 04/2

Information on the horizontal and vertical distributions of density and wind and their variation with time is important in the design and operation of aerospace vehicles as well as to atmospheric scientists seeking a more precise description of atmospheric structure. Consequently, we have estimated the variations of density and wind at seven locations for periods of from 1 to 72 h between altitudes 30 and 60 km. In the tropics density variations with time are dominated by a diurnal cycle. At other latitudes the diurnal cycle is too small to detect in a lag variability study based on Meteorological Rocket Network observations because the diurnal components are obscured by random observational errors as well as day-to-day changes in synoptic conditions. In summer there is only a small increase in rms variability of density with time at middle and high latitudes; rms values range from 20 to 4 percent for periods up to 72 h. In winter there is a marked change in the rms variability with time at midlatitudes where rms values increase with time, approaching the climatic variability of 5 or 6 percent in 72 h. At high latitudes rms variations increase more rapidly with time and reach 8 or 9 percent within 72 h. Analyses of midlatitude wind data between 30 and 60 km confirm the presence of a well-defined diurnal wind oscillation. It reaches a maximum amplitude of 10 or 11 m/sec between 50 and 55 km; amplitudes tend to be slightly smaller in tropical and polar regions. Author (GRA)

N82-20821# Woods Hole Oceanographic Institution, Mass.

PERFORMANCE CHARACTERISTICS OF SOME WIND SENSORS

Richard E. Payne Dec. 1981 59 p refs

(Contract N00014-76-C-0197; Grant NSF OCE-80-14941; NR Proj. 083-400)

(AD-A109508; WHOI-81-101) Avail: NTIS HC A04/MF A01 CSCL 04/2

Summaries of performance data on three wind recorder sensor sets are presented: a W.H.O.I.-built vane and cup set mounted on a vector averaging current meter (VAWR), a set of standard orthogonal propellers from the vector measuring current meter (VMWR), and an R. M. Young Company utility cup and vane set (Gill). Data were recorded in a wind tunnel and on a dock. Cup or propeller distance constants were 14.5 m (VAWR), 11 m (VMWR), and 3.5 m (Gill). The VMWR propeller distance constant varied little with azimuth. The VAWR cups had the least sensitivity to tilt, less than 5% at 30 deg. compared to 5% and 10% at 20 deg. for the Gill and VMWR. The Gill and VAWR vanes had delay constants of 1.4 m and 2.6 m, damping factors of .67 and .58, and natural wavelengths of 5.9 m and 10 m, respectively, with some doubt of the VAWR vane figures due to experimental uncertainties. That the Gill cups had the least overspeeding was apparent even in the vector averaged wind speeds from the dock intercomparisons. In general, the Gill set is capable of recording vector averaged winds on a buoy more accurately than the VAWR or VMWR set although it is not as rugged mechanically. Author (GRA)

N82-20822# Digital Programming Services, Inc., Waltham, Mass.

DEVELOPMENT AND APPLICATIONS OF TECHNIQUES TO PROCESS HYDROMETEOR DISTRIBUTION DATA Final Report, 1 May 1978 - 31 Jul. 1981

Lawrence E. Belksy, Fredric B. Kaplan, James P. Lally, D. Keith Roberts, and Terence OToole 31 Jul. 1981 636 p

(Contract F19628-78-C-0131; AF Proj. 627A)

(AD-A109929; AFGL-TR-81-0261) Avail: NTIS HC A99/MF A01 CSCL 04/2

This report summarizes the mathematical procedures used on a variety of standard and non-standard cloud physics data. It includes the complete descriptions and operating instructions for all programs developed under this contract. GRA

N82-20578# Bayerische Akademie der Wissenschaften, Munich (West Germany).

THE ESTIMATION OF WEIGHTS OF METEOROLOGICALLY INFLUENCED MEASUREMENTS

Heribert Kahmen *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union of Geodesy and Geophys. 1980 p 29-39 refs (For primary document see N82-20575 11-42)

Avail: NTIS HC A06/MF A01

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N82-20823*# California Univ., La Jolla. Inst. of Marine Resources.

SHIP AND SATELLITE BIO-OPTICAL RESEARCH IN THE CALIFORNIA BIGHT

Raymond C. Smith and Karen S. Baker [1982] 23 p refs (Grant NsG-1641)

(NASA-CR-168681; NAS 1.26:168681) Avail: NTIS HC A02/MF A01 CSCL 08A

Mesoscale biological patterns and processes in productive coastal waters were studied. The physical and biological processes leading to chlorophyll variability were investigated. The ecological and evolutionary significance of this variability, and its relation to the prediction of fish recruitment and marine mammal distributions was studied. Seasonal primary productivity (using chlorophyll as an indication of phytoplankton biomass) for the entire Southern California Bight region was assessed. Complementary and contemporaneous ship and satellite (Nimbus 7-CZCS) bio-optical data from the Southern California Bight and surrounding waters were obtained and analyzed. These data were also utilized for the development of multi-platform sampling strategies and the optimization of algorithms for the estimation of phytoplankton biomass and primary production from satellite imagery. R.J.F.

N82-20824# National Research Inst. for Oceanology, Stellenbosch (South Africa). Physical Oceanography Div.

INTERACTION BETWEEN THE AGULHAS CURRENT AND THE SUBTROPICAL CONVERGENCE

J. R. E. Lutjenarms Feb. 1981 42 p refs Presented at the 4th Natl. Oceanographic Symp., Cape Town, 10-13 Jul. 1979 (CSIR-RR-384) Avail: NTIS HC A03/MF A01

The Agulhas Current which loses its essential character as a western boundary current south of South Africa is discussed. This ocean area is known as an area of dramatic dynamical variability. To investigate this variability, and the mechanisms responsible, a number of satellite products covering a period of over two years were studied. A number of dynamical phenomena were observed and are described. These include the genesis and growth of sheer edge eddies on the landward border of the current, the nature and location of the Agulhas retroflection region, the formation of Agulhas rings in the south-east Atlantic Ocean, and the nature and variability of planetary waves in the subtropical convergence. The possible interaction between these features of the circulation is discussed in so far as the limited data allow this, and a conceptual image of the macroscale current dynamics in the area is presented. Author

N82-20825# National Research Inst. for Oceanology, Stellenbosch (South Africa). Electronics and Instrumentation Group.

COASTAL ENGINEERING MODEL HALL DATA-ACQUISITION SYSTEM

S. G. Holroyd 1981 183 p

(CSIR-RR-383/1; ISBN-0-7988-1805-0) Avail: NTIS HC A09/MF A01

A data acquisition system for the collection, handling and processing of data in the coastal engineering model hall is described. Apart from providing the data highway from model instrumentation to data storage devices or the minicomputer center, it also provides the necessary structure to permit the automation of model testing. The standard operating system is described and the procedure for expanding the system hardware and software, is given. S.L.

N82-20826# National Research Inst. for Oceanology, Stellenbosch (South Africa). Electronics and Instrumentation Group.

COASTAL ENGINEERING MODEL HALL DATA-ACQUISITION SYSTEM

S. G. Holroyd 1981 187 p

(CSIR-RR-383/2; ISBN-0-798801806-9) Avail: NTIS HC A09/MF A01

A data acquisition system for the collection, handling, and processing of data in the coastal engineering model hall was developed. The real time clock program as used on the function board is presented. A trimmed version of the assembler listing for the additional function REFLEC, and the standard operating system STANOP listing are given. S.L.

N82-20827# Naval Research Lab., Washington, D. C. Aerospace Systems Div.

SURFACE WAVE STATISTICS AND SPECTRA DURING HIGH SEA STATE CONDITIONS IN THE NORTH ATLANTIC

C. R. McClain, D. T. Chen, and W. D. Hart 30 Dec. 1981 33 p refs

(RR0320841; WF59553000)

(AD-A109832; NRL-MR-4722) Avail: NTIS HC A03/MF A01 CSCL 08/3

Surface wave data collected using an airborne laser profilometer during high sea state conditions are analyzed to produce statistical cumulants up to the fifth order and power spectra. Theoretically, the third cumulant, skewness, is directly proportional to the wind-wave significant slope. This relationship is supported by wind-wave tank data, but little field data of this kind is available in the literature. Also, it has been suggested that if skewness can be derived from radar altimeter data, the significant slope would be computed and together with another altimeter product, the rms wave height, the wave spectra can be estimated using the Wallops Spectral Model (WSM). The results of this study indicate that the skewness relationship is valid for wind-wave dominated seas but as the swell contribution to rms wave height increases, the combined wave field skewness monotonically decreases below the predicted value. The WSM yields excellent reproductions of the wind-wave spectra even in multiple-peaked seas providing that the model inputs are properly determined for the wind-wave subfield. Finally the altimeter-WSM scheme should work reasonably well when the seas are wind-wave dominated provided that the altimeter can accurately measure skewness. More research on intermediate and swell dominated conditions is recommended. Author (GRA)

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N82-20828*# Utah State Univ., Logan.

HIGHER PLANT RESPONSE TO ELEVATED ULTRAVIOLET IRRADIANCE Final Report

Martyn M. Caldwell 30 Dec. 1981 425 p refs (Contract NAS9-14871)

(NASA-CR-167538; NAS 1.26:167538) Avail: NTIS HC A18/MF A01 CSCL 06C

The effect of ultraviolet irradiation on pollen germination, ultraviolet action spectra influencing photosynthesis, and plant adaptations to ultraviolet-B radiation are reported. For individual titles, see N82-20829 through N82-20831.

N82-20829*# Utah State Univ., Logan.

THE ULTRAVIOLET RADIATION ENVIRONMENT OF

POLLEN AND ITS EFFECT ON POLLEN GERMINATION Final Report

In its Higher Plant Response to Elevated Ultraviolet Irradiance 30 Dec. 1981 50 p refs (For primary document see N82-20828 11-51)

Avail: NTIS HC A18/MF A01 CSCL 06C

The damage to pollen caused by natural ultraviolet radiation was investigated. Experimental and literature research into the UV radiation environment is reported. Viability and germination of wind and insect pollinated species were determined. Physiological, developmental, and protective factors influencing UV sensitivity of binucleate, advanced binucleate, and trinucleate pollen grains are compared. J.D.H.

N82-20830*# Utah State Univ., Logan.

PROTECTIVE MECHANISMS AND ACCLIMATION TO SOLAR ULTRAVIOLET-B RADIATION IN OENOTHERA STRICTA Final Report

Ronald Robberecht and Martyn M. Caldwell *In its* Higher Plant Response to Elevated Ultraviolet Irradiance 30 Dec. 1981 59 p refs (For primary document see N82-20828 11-51)

Avail: NTIS HC A18/MF A01 CSCL 06C

Plant adaptations ameliorating or repairing the damaging effects of ultraviolet-B (UV-B) radiation on plant tissue were investigated. The degree of phenotype plasticity in UV protective mechanisms and acclimation in relation to the natural solar UV-B radiation flux and in an enhanced UV-B irradiance environment was also examined. Mechanisms by which plants avoid radiation, adaptations altering the path of radiation incident on the leaf, and repair processes were considered. Attenuation of UV-B by tissues, UV-B irradiation into the leaf, and the effects of UV-B on photosynthesis were investigated. J.D.H.

N82-20831*# Utah State Univ., Logan.

ACTION SPECTRA FOR PHOTOSYNTHETIC INHIBITION Final Report

Martyn M. Caldwell, Stephan Flint, and L. B. Camp *In its* Higher Plant Response to Elevated Ultraviolet Irradiance 30 Dec. 1981 20 p refs (For primary document see N82-20828 11-51)

Avail: NTIS HC A18/MF A01 CSCL 06C

The ultraviolet action spectrum for photosynthesis inhibition was determined to fall between that of the general DNA action spectrum and the generalized plant action spectrum. The characteristics of this action spectrum suggest that a combination of pronounced increase in effectiveness with decreasing wavelength, substantial specificity for the UV-B waveband, and very diminished response in the UV-A waveband result in large radiation amplification factors when the action spectra are used as weighting functions. Attempted determination of dose/response relationships for leaf disc inhibition provided inconclusive data from which to deconvolute an action spectrum. J.D.H.

N82-20832*# California Univ., Berkeley. Environmental Physiology Lab.

BODY COMPOSITION DATA FROM THE RAT SUBJECTS OF COSMOS 1129 EXPERIMENT K-316

Nello Pace, Arthur H. Smith, Grover C. Pitts, Arkadyi S. Ushakov, and Tamara A. Smirnova 15 Jan. 1982 63 p refs (Grant NsG-7336)

(NASA-CR-168678; NAS 1.26:168678; EPL-82-1) Avail: NTIS HC A04/MF A01 CSCL 06C

The effects of 18.5 days of weightlessness on the body composition of young, growing, male laboratory rats were examined. Three groups of 5 rats each were examined. It is indicated that exposure of young, growing, male rats to 18.5 days of weightlessness produces: (1) no effect on the quantity of fat stored by the body; (2) a slight reduction in the quantity of fat free tissue laid down by the body; (3) a small reduction in the fraction of water contained by the fat free body mass; (4) a similar reduction in the fraction of water contained by the fat free skin and fat free carcass; (5) a shift in relative distribution of the total body water from skin to viscera; (6) a diminution in the fraction of extracellular water contained by the fat free body; (7) no effect on the fraction of total skeletal musculature contained by the fat free body, as indicated by body creatine content; (8) a sizeable reduction in the fraction of bone mineral contained by the fat free body, as calculated from body calcium content. The nature of the physiological changes induced by unloading from Earth gravity in the mammalian organism are illustrated. GRA

N82-20833# Office of Naval Research, London (England).

FIFTH INTERNATIONAL BIODETERIORATION SYMPOSIUM

E. C. Haderlie 2 Dec. 1981 12 p Symp. held at Aberdeen, Scotland, 7-11 Sep. 1981

(AD-A109858; ORNL-C-13-81) Avail: NTIS HC A02/MF A01 CSCL 06/1

The meeting covered most aspects of biodeterioration ranging from the degradation of library materials to woods, metals, petroleum products, and wool. Biodeterioration was defined as the degradation of materials as a result of the activities of living organisms. Author (GRA)

N82-20834# Joint Publications Research Service, Arlington, Va.

USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 16, NO. 1, JANUARY - FEBRUARY 1982

16 Mar. 1982 148 p refs Transl. into ENGLISH of Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 (JPRS-80323) Avail: NTIS HC A07/MF A01

Articles addressing various aspects of aerospace medicine and space biology are presented. Physiological responses to space flight are emphasized along with problems relating to aircraft pilot performance. For individual titles, see N82-20835 through N82-20859.

N82-20835# Joint Publications Research Service, Arlington, Va.

EFFECT OF RADIOPROTECTIVE AGENTS ON REACTIVITY TO SPACE FLIGHT FACTORS

Ye. I. Vorobyev, V. I. Yefimov, and S. K. Karsanova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 1-14 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 4-12 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

The experimental and clinical data published during the last 15 years that concern the effect of radioprotector drugs on the reactivity of organisms exposed to acceleration, vibration, motion sickness, hypodynamics, hypo- and hyperoxia are summarized and discussed. It is concluded that it is possible to use drugs to enhance radioresistance during flights; however, one should proceed with some caution in recommending a specific inflight radioprotective agent. The results of studies with the participation of man confirmed the assumption that intake of the short-acting radioprotector ambratin and prolonged-action protector amitetravit has no adverse effect on the human body according to tests with endurance of motion and prolonged accelerations. For this reason, they were recommended as radioprotective agents for use during manned flights aboard the Soyuz series of spacecraft. M.G.

N82-20836# Joint Publications Research Service, Arlington, Va.

SOLAR ACTIVITY, DYNAMICS OF OZONOSPHERE AND POSSIBLE ROLE OF ULTRAVIOLET RADIATION IN HELIOBIOLOGY **c46**

B. M. Vladimirskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 15-19 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 12-15 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

The effect of solar activity on the biosphere is addressed. It is noted that solar activity influences the ozonosphere thickness, thus changing the intensity of the near-earth ultraviolet radiation in the B band. In certain regions the radiation may change by 10 to 15%, with solar activity varying from its maximum to minimum. The variations in the ultraviolet intensity are very likely to be environmentally important. Thus, solar ultraviolet radiation at lambda = 290 to 340 nm acts as one more physical agent transferring the effect of solar activity into the biosphere. M.G.

N82-20837# Joint Publications Research Service, Arlington, Va.

STRESS AND BIOLOGICAL RHYTHMS **c52**

S. I. Stepanova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 2025 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 16-20 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

It is noted that numerous data give evidence that the reactions of the human body to diverse stimuli vary in an oscillatory, wave-like pattern. This phenomenon is associated with a general biological law of the wave-like pattern of adaptive processes, according to which they are realized at any stage (anxiety, resistance, depletion) in an oscillatory pattern. The wave-like pattern of the adaptive process is an expression of the dialectic law of unity and struggle of opposites; in this case, unity and struggle of construction and destruction, maintaining continuous self-reproduction and self-preservation of a living system in its environment. Consideration of the law of undulatory nature of the adaptation process in space opens the way for reliable forecasting of the dynamics of general state and different functions of cosmonauts during flights. It is imperative to make a special study of this phenomenon in order to further refine the set of measures related to the support of man's life in space. M.G.

N82-20838# Joint Publications Research Service, Arlington, Va.

RESULTS OF STUDIES OF COSMONAUTS' VESTIBULAR FUNCTION AND SPATIAL PERCEPTION **c52**

I. Ya. Yakovleva, L. N. Kornilova, I. K. Tarasov, and V. N. Alekseyev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 26-33 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 20-26 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

The results of studying the vestibular function and the function of spatial perception in 26 cosmonauts before and after 30 space flights are discussed. The typical postflight changes in these functions were: an increase in the reactivity of the otolith organ; a decrease in the sensitivity of semicircular canals; a decline in the accuracy of perception of spatial coordinates; asymmetry of most parameters, and development of illusionary reactions inflight. The cosmonauts also showed individual variations with respect to the degree of the above responses, the dynamics and length of adaptation, the development of the motion sickness symptom-complex, etc. At R+O some cosmonauts exhibited a change in the direction of the eye counter-rotation, i.e., the negative otolith reflex or at turn towards the tilt direction. Possible mechanisms of these vestibular changes are discussed. M.G.

N82-20839# Joint Publications Research Service, Arlington, Va.

PROBABILITY OF CAISSON DISEASE AFTER PRESSURE DROP FROM 840 TO 308 MM Hg **c52**

A. S. Barer, M. I. Vakar, G. F. Vorobyev, L. R. Iseyev, S. N. Filipenkov, and V. I. Chadov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 34-37 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 26-28 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

The mode of decompression to a pressure of 308 mm Hg after exposure for 2 to 12 h to a hyperbaric air atmosphere at a pressure of 840 mm Hg was studied. The objective was to determine the effect of additional saturation of the body with nitrogen in the presence of elevated air pressure on probability of caisson disease (altitude decompression sickness) after changing to an absolute pressure of 308 mm, which is relatively safe in decompression from normal Earth atmosphere. The decompression from the hyperbaric air atmosphere with the pressure 840 + or - 5 mm Hg and subsequent 40 min exposure to the hypobaric atmosphere 308 + or - 1 mm Hg containing 40 to 95% O2 caused a decompression disease in 5 to 40% cases. The probability of the disease depends on the duration of nitrogen saturation at an increased pressure, physical fitness and individual susceptibility to decompression sickness. M.G.

N82-20840# Joint Publications Research Service, Arlington, Va.

ION REGULATING FUNCTION OF HUMAN KIDNEYS DURING LONG-TERM SPACE FLIGHTS AND IN MODEL STUDIES **c52**

A. L. Grigoryev, B. R. Dorokhova, G. S. Arzamazov, and B. V. Morukov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 38-44 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 29-33 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

Ten cosmonauts who performed 30- to 175-day space flights onboard Salyut-4 and Salyut-6, and 50 test subjects exposed to head-down tilt (-4 deg) for 182 days were examined. In actual and simulated weightlessness renal excretion of calcium and potassium increased, reaching maximum during the 4 to 6th weeks. Before and after flight the test subjects were exposed to loading salt tests. Renal excretion of calcium and potassium in response to the loading tests with their salt postlight was much higher than preflight. During the potassium chloride load the aldosterone content in blood correlated with potassium excretion, and during the calcium lacate load an increase in calcium excretion was paralleled by a decrease in the para-thormone content in blood. It is most likely that the negative balance of ions in weightlessness is associated with the reduced capacity of tissues to retain electrolytes due to the decreased ion pool. It was shown that electrolyte balance can be beneficially influenced by exercise. M.G.

N82-20841# Joint Publications Research Service, Arlington, Va.

STRUCTURAL AND FUNCTIONAL PROPERTIES, AND ENERGY METABOLISM OF ERYTHROCYTES DURING SPACE FLIGHTS VARYING IN DURATION **c52**

A. S. Ushakov, G. I. Kozinets, S. M. Ivanova, and V. P. Matviyenko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 45-50 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 34-37 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

The structural and functional properties and energy metabolism of erythrocytes in peripheral blood of crew members who performed space flights of varying duration were investigated. Certain changes in the morphology, function, and energy metabolism of erythrocytes were seen after long-duration space flights. The demonstrated changes in energy metabolism (decline of ATP and increase in glycolytic activity) are probably related to triggering of compensatory mechanisms in response to the effects of space flight factors, and they are directed toward preserving the structural integrity of cells. On the whole, the obtained data indicate that short-term flights lasting up to 8 days do not elicit appreciable changes in structural and functional, as well as metabolic parameters of erythrocytes. M.G.

N82-20842# Joint Publications Research Service, Arlington, Va.

POSITIVE PRESSURE BREATHING AS A MEANS OF PREVENTING ADVERSE REACTIONS TO ANTIORTHOSTATIC POSITION **c52**

V. G. Voloshin, V. A. Karpusheva, B. F. Asyamolov, R. A. Bondarenko, and V. S. Panchenko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 51-54 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 38-40 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

The experiments in which 15 healthy male test subjects were exposed to head-down tilts at -15 and -30 deg demonstrated that the central and cerebral circulation can be normalized by a positive pressure breathing of 15 to 20 mm Hg with a partial compensation. Author

N82-20843# Joint Publications Research Service, Arlington, Va.

RELATIONSHIP BETWEEN MICROFLORA AND IMMUNITY OF COSMONAUTS CARRYING STAPHYLOCOCCUS AUREUS IN THE NASAL CAVITY **c52**

T. N. Nikolayeva, Ye. V. Guseva, R. Yu. Tashpulatov, and G. D. Syrykh *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 55-58 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 40-43 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

The correlations between microflora and preflight parameters of immunological resistance of cosmonauts who were carriers of S. aureus in the nasal cavity and subjects who are not carriers of this microorganism were examined. The crewmembers who carried aureus in the nasal cavity preflight showed an increased content of immunoglobulins IgA and IgM in the nasal cavity and that of IgM in blood serum postflight. The increased content of IgM in the nasal cavity did not depend on the size of the microbial focus in that biotope because there was no significant correlation between the two parameters (local and serum). M.G.

N82-20844# Joint Publications Research Service, Arlington, Va.

CORRELATION BETWEEN INDIVIDUAL DISTINCTIONS OF FUNCTIONAL ASYMMETRY OF CEREBRAL HEMISPHERES AND PILOT PERFORMANCE **c53**

A. A. Gyurdzhian and A. G. Fedoruk *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 59-62 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 44 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

It was shown that the high professional characteristics of pilots (quality of their flight performance and low susceptibility to spatial illusions) are in close correlation with the more pronounced predominance of the left hemisphere of the brain. The most informative criterion of the left hemisphere predominance that correlates with the flight performance is the index of the right ear predominance, i.e., the index of the left hemisphere predominance with respect to the speech perception. The less demonstrative parameters are the predominance of the right hand and the leading right eye. R.J.F.

N82-20845# Joint Publications Research Service, Arlington, Va.

INFLUENCE OF ORIENTATION METHOD ON QUALITY OF PILOT'S SPATIAL ORIENTATION **c53**

V. V. Lapa and N. A. Lemeshchenko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 63-68 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 63-68 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

The efficiency of pilot's spatial orientation after disorientation was studied in relation to the coordinates system used, i.e., the method of orientation. It was found that the use of the geocentric system of coordinates (as compared to that of the geocentric system) caused and increase in the time of spatial perception and in the number of errors. It can therefore be concluded that the instrument-aided spatial orientation inflight (with the Earth unseen) must help the pilot to develop spatial perception, reflecting spatial relations in the geocentric system of coordinates. Author

N82-20846# Joint Publications Research Service, Arlington, Va.

DYNAMIC OF NUTRITIONAL STATUS DURING SIMULATION OF LONG-TERM AIRCRAFT FLIGHTS **c54**

I. G. Popov, A. A. Latskevich, V. Ye. Potkin, P. A. Lozinskiy, I. A. Romanova, and L. I. Kolesnikova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 69-76 refs Transl. into ENGLISH form Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 49-55 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

The dynamics of the nutrient status of the test subjects who performed a simulated 22 hour flight and consumed preflight and flight diets was investigated. Subjective and objective indications (body mass changes, carbohydrate, nitrogen, amino acid, mineral, and vitamin metabolism) of excessive nutrition and even acute overeating were seen. It is emphasized that, in order to prevent excessive nutrition of pilots and its harmful effects on their performance, special counter measures need to be developed. Author

N82-20847# Joint Publications Research Service, Arlington, Va.

SOME FEATURES OF EVALUATION OF WORK CAPACITY AND FATIGUE IN HELICOPTER PILOTS **c54**

Yu. N. Kamenskiy *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1981 (JPRS-80323) 16 Mar. 1982 p 77-81 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 55-58 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

In helicopter pilots the direct index of their work capacity increased while indirect indices decreased in the course of the flying shift. The peak of their professional performance occurred at the end of the flying shift coinciding with the expressed feeling of fatigue. Evaluation of professional work capacity using direct methods does not yield adequate information about the state of pilots, making them unsuitable to diagnose fatigue and to measure permissible work load. Proper diagnostics of fatigue does not necessarily require examinations of the pilot's state inflight. Adequate information can be obtained on the ground during the flying shift. Author

N82-20848# Joint Publications Research Service, Arlington, Va.

PHYSIOLOGICAL AND HYGIENIC RATING OF TRANSPORT HELICOPTER VIBRATION DAMPER **c54**

Yu. G. Matveyev and Yu. N. Kamenskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 82-86 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 59-61 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

The vibration damper reduces vibrations in the helicopter cockpit two to three-fold during horizontal flight and four to five-fold at the braking stage. The use of the vibration damper improves reception of the panel information and helicopter control, improves the working conditions, and maintains the high performance of the crewmembers during the flying shift. R.J.F.

N82-20849# Joint Publications Research Service, Arlington, Va.

SIGNIFICANCE OF BONE DENSITY TO SPINAL TRAUMA RELATED TO PILOT EJECTION **c52**

A. P. Kozlovskiy, G. P. Stupkov, V. P. Dryannykh, A. B. Arsentyev, and V. V. Chuntul *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 87-89 refs Transl. into ENGLISH form Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 62-63 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

The examinations of 27 pilots, 10 of which were catapulted, demonstrated that fractures of the spinal column occurred in those pilots (5 cases) whose heel bone density (as measured by the method of direct photon absorption) was lower than in the controls (17 cases) and in those pilots who did not have traumas, when being ejected. Author

N82-20850# Joint Publications Research Service, Arlington, Va.

SIGNIFICANCE OF VESTIBULAR ASYMMETRY TO GENESIS OF VESTIBULAR DYSFUNCTION **c52**

V. A. Kislyakov and Yu. K. Stolbkov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 90-94 refs Transl. into ENGLISH from Kosm. Biol. Avaikosm. Med. (Moscow), v. 16,

no. 1, Jan. - Feb. 1982 p 64-67 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

In the intact pigeons and pigeons with bilaterally cut saccular nerves, stimulation of the otolith organs did not produce asymmetric reactions from the semicircular canals, whereas in pigeons with unilaterally cut saccular nerves it resulted in the asymmetry of reactions from the semicircular canals. This asymmetry was enhanced by a combined stimulation of semicircular canals and otolith organs. Author

N82-20851# Joint Publications Research Service, Arlington, Va.
OPTOKINETIC FACTORS AND DEVELOPMENT OF SEA-SICKNESS SYMPTOMS **c52**
L. N. Kornilova, V. A. Shakhiyeva, and I. Ya. Yakovleva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 95-99 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 67-70 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

The effects of optokinetic stimulation of a healthy man and the development of motion sickness symptoms in response to the stimuli of different value and direction are discussed. Selective sensitivity of healthy people to optokinetic stimulaton is also discussed. R.J.F.

N82-20852# Joint Publications Research Service, Arlington, Va.
HUMAN TOLERANCE OF ROTATION AT DIFFERENT LEVELS OF HYPERGRAVITY **c54**
A. M. Genin, A. R. Kotovskaya, R. R. Galle, L. N. Gavrilova, and I. Yu. Sarkisov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 100-106 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 70-74 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

The effects of acceleration of different values (up to 2 g) on the level of motion sickness, vestibular, and postural reactions to rotation were studied. The experiments were carried out in a centrifuge equipped with a cabin that could be mounted at a different distance from the axis of rotation. Three experimental runs were conducted with a rate of rotation of 15.3 and acceleration values of 1.09, 1.6, and 2.0 g. Vestibular stimulation was produced by heat movements of a predetermined number. It was found that with increase in the the acceleration value the level of motion sickness decreased and the nystagmic reaction and balance dysfunction enhanced. Author

N82-20853# Joint Publications Research Service, Arlington, Va.
COMPARATIVE EVALUATION OF PRESSURE CHAMBER CONDITIONING AND MAN'S ADAPTATION TO HYPOXIA AT HIGH ALTITUDE **c52**
A. Yu. Katkov, R. N. Chabdarova, N. V. Pravetskiy, S. A. Vtoryy, V. V. Lenskiy, and A. A. Titov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 107-110 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 74-77 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

It was demonstrated that a 3 day pressure chamber training may increase the maximum tolerable altitude at rest from 8,600 to 8,900 m (depending on the onset rate of hypoxia) to 9,600 m. After pressure chamber training the maximum tolerable altitude increased from 8,200 m to 9,200 m, when exercising in a bicycle ergometer at 200 kgm/min and continuously ascending at a rate of 20 m/sec. A similar antihypoxic effect was also provided by a 7 day high altitude adaptation. Using polarographic measurements of oxygen tension in the skin, it was found that adaptation to hypoxia induced a more pronounced oxygen decrease at high altitudes. This can be attributed to a more distinct blood redistribution, i.e., a better blood supply of the vital organs at the expense of peripheral tissues. Author

N82-20854# Joint Publications Research Service, Arlington, Va.
ACTIVITY OF SOME RAT LIVER ENZYMES FOLLOWING FLIGHT ABOARD COSMOS-936 BIOSATELLITE
S. Nemeth and R. A. Tigranyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 111-115 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 77-80 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

After the 18.5 day flight onboard the biosatellite Cosmos-936, the activity of 6 glucocorticoid-activated enzymes in the rat liver was investigated. It was found that at R+O activities of tyrosine aminotransferase and tryptophan pyrolase, as well as fructose-1,6-diphosphatase, glucose-6-phosphatase, aspartate aminotransferase and alanine aminotransferase increased. Two two former enzymes react rapidly (within several hours) to an increase in the glucocorticoid level, whereas those latter react only to a continuous prolonged effect of glucocorticoids. These increases were paralleled by a growth in the glycogen concentration in the liver. The findings indicate that during the flight the rats underwent a chronic stress induced by weightlessness. Author

N82-20855# Joint Publications Research Service, Arlington, Va.
CATECHOLAMINE CONTENT OF RAT BLOOD AFTER FLIGHT ABOARD COSMOS-936 BIOSATELLITES
R. Kvetnansky and R. A. Tigranyan *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 116-119 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 80-83 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

The content of epinephrine and norepinephrine was measured in plasma of the rats flown onboard the biosatellite Cosmos-936 in the weightless state and under artificial gravity. With respect to the norepinephrine content there was no difference between the two flight groups, while its level in the flight rats was higher than in the ground-based controls. The epinephrine content in the flight rats remained essentially unchanged. These data give evidence that a prolonged exposure to weightlessness is not a stressogenic factor as related to the sympathoadrenal system. Author

N82-20856# Joint Publications Research Service, Arlington, Va.
INFLUENCE ON UREA HYDROLYSIS OF TYPICAL MICROFLORA OF URINE AND PRESSURIZED HABITATS
T. Ye. Lebedeva, I. V. Yakimova, N. M. Nazarov, and S. V. Chizhov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 120-123 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 84-86 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

The intensive discharge of microorganisms from the human integument into the environment in a pressure chamber was investigated. The role of microflora in the process of dissociation of urea contained in urine was investigated. The ammonia released as a result of hydrolysis pollutes the atmosphere of the sealed space and has an adverse effect on the quality of water reclaimed from urine and complicates the regeneration process proper. The following areas were studied: (1) investigation of dynamics of total number of microorganisms of urine when stored for a long time under nonsterile conditions and comparison to dynamics of decomposition of urea and accumulation of ammonia in urine; (2) determination of quantity of microorganisms and intensity of decomposition of urea when sterile urine is used for monocultures of bacteria that are the most typical of the microflora of urine and sealed habitats; (3) comparative evaluation of urease activity of several strains of bacteria isolated from the interior surfaces of a manned spacecraft in flight and analogous stock strains. B.W.

N82-20857# Joint Publications Research Service, Arlington, Va.

HEMATOGICAL LESIONS AS A FUNCTION OF DOSAGE OF LONG-TERM RADIATION

V. G. Gorlov and O. V. Neyman *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 124-129 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 86-89 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

The quantitative patterns of damage to the blood system in the course of prolonged exposure to the ionizing radiation inherent in space were studied as well as the time characteristics of development of lesions in different blast elements. An effort was made to determine the minimal volume of hematological tests during long-term exposure to radiation to assess the general state of the blood system, on the basis of comparison of dynamics of changes in bone marrow and peripheral blood. Experiments were conducted on 285 mongrel rats weighing 180 to 200 g. The animals were exposed to radiation at dose rates of 300, 100, and 50 R/day. They were exposed continuosuly for 22-23/day. Analysis of the findings revealed that the dynamics of decline in total number of bone marrow cells during the phase of primary depletion is governed by an exponential law. There was distinct demonstration of the effects of cumulative dose and dose rate. A typical finding in all cell populations of bone marrow was an initial exponential decline in number of cells. B.W.

N82-20858# Joint Publications Research Service, Arlington, Va.

SEROTONIN AND HISTAMINE METABOLISM IN COSMONAUTS c52

Z. S. Dolgun, S. A. Meshcheryakova, M. S. Belakovskiy, and V. I. Legenkov *In its* USSR Rept.: Space Biol. and Aerospace Med. Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 130-133 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 89-91 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

The effects of space flight conditions on serotonin (S) and histamine (H) concentration in animal and human blood were studied. Excretion of 5-hydroxyindoleacetic acid (HIA) in urine, change under cold stress and high temperatures, anaphylactic shock, hypoxia and short- and long-term vibration were examined during prolonged hypokinesia. Certian changes were demonstrated in blood S content in animals examined after returning from a short-term space flight. B.W.

N82-20859# Joint Publications Research Service, Arlington, Va.

FIRST ALL-UNION SYMPOSIUM ON PROBLEMS OF EVALUATING AND FORECASTING MAN'S FUNCTIONAL STATES IN APPLIED PHYSIOLOGY

A. A. Maksimov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 134-135 Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 91-92 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

Some aspects of the problems of man's functional states, his health, and work capacity were studied. The following topics were examined: forecasting man's functional state in aviation and cosmonautics; forecasting the functional state of athletes; forecasting the functional state of the body in industrial physiology; forecasting in human ecology; and reliability of man-machine systems. B.W.

N82-20860 California Univ., San Diego.

PATTERNS OF BACTERIOPLANKTON GROWTH IN THE SEA Ph.D. Thesis

Jed Alan Fuhrman 1981 122 p

Avail: Univ. Microfilms Order No. 8129243

The bacterioplankton role in organic matter flux from phytoplankton to higher trophic levels was studied. Two approaches were developed for measuring bacterioplankton growth. The first assumes only growing cells synthesize DNA; rates of tritiated thymidine incorporation into DNA are used to calculate bacterioplankton growth rates. The second approach measures the increase of bacterial numbers in seawater which had been filtered to remove bacteriovores. The thymidine incorporation approach was more sensitive, faster and easier to use at sea, and less subject to artifacts than the other approach, so it was chosen for most field studies almost exclusively by bacteria, and effectively all the 'active' bacteria utilize exogeneous thymidine. Production estimates were lower in Antarctic waters than in temperate waters and the fraction of primary production which is channeled into bacterioplankton production in both eutrophic and oligotrophic waters was approx. 5% to 25%. Dissert. Abstr.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N82-20861 Michigan State Univ., East Lansing.

ULTRASONIC BLOOD FLOW IMAGING USING CORRELATION PROCESSING Ph.D. Thesis

Michael De Olinger 1981 58 p

Avail: Univ. Microfilms Order No. 8126538

A general investigation of those fundamental processes affecting the design of ultrasonic blood flow imaging instruments is presented. First, known physical attributes of the various biological issues are combined to formulate a simple model which describes the interaction of ultrasound with the human body. Using this model, it is shown that a periodic pulse train is the preferred transmitted signal and that significant performance improvement may be realized by implementing true correlation as opposed to the conventional correlation processing. The desirability of having the true correlation receiver operate in a near optimum manner is demonstrated and the constraints imposed on signal bandwidth, effective signal duration, achievable velocity resolution and transducer angle are presented. In order to present the complex interrelationships which exist between these constraints, a unique set of design curves were generated. These curves indicate those combinations which insure near optimality. Dissert. Abstr.

N82-20862 Washington Univ., Seattle.

A QUANTITATIVE ANALYSIS OF TRANSCUTANEOUS OXYGEN MEASUREMENT Ph.D. Thesis

Daniel Wade Piraino 1981 207 p

Avail: Univ. Microfilms Order No. 8126136

The effects of skin blood flow, diffusion, and temperature each independently on the transcutaneous measurement of oxygen were determined. A model was derived to predict the transcutaneous oxygen partial pressure under varying conditions of blood flow, temperature, and arterial oxygen partial pressure. The model was then compared to data from twelve volunteer subjects under different conditions of blood flow and temperature. The following results were found. (1) The model is valid only after heating the sensor to 44-45 C. (2) There is a hysteresis with temperature in the quantity d/x sub o, where d is the diffusion constant and x sub o is the distance from capillary to skin sensor. If skin is preheated to 44-45 C for one-half hour, transcutaneous oxygen measurements at a lower temperature will be higher than if the skin had not been preheated, at the same blood flow. (3) At 41 C, with the hemoglobin curve shift taken into account, skin blood flow is adequate for 97% arterialization. These results may be applied to the future correction of the transcutaneous oxygen value in adult patients in critical care areas. Dissert. Abstr.

N82-20863*# National Aeronautics and Space Administration, Washington, D. C.

STUDIES ON THE FLIGHT MEDICAL ASPECTS OF THE GERMAN LUFTHANSA NON-STOP ROUTE FROM FRANKFURT TO RIO DE JANEIRO, PART 1

H. M. Wegmann, K. E. Klein, K. M. Goeters, and A. Samel Feb. 1982 29 p refs Transl. into ENGLISH of rept. IB-316-81-01 DFVLR (West Germany), 1981 26 p Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3541)

(NASA-TM-76659; NAS 1.15:76659) Avail: NTIS HC A03/MF A01 CSCL 06S

The problem of crew size for regularly scheduled flights between Frankfurt and Rio de Janeiro is discussed. Factors affecting crew performance are examined, comparisons are drawn to regulations of other countries and crew questionnaires and tests are presented. S.L.

N82-20864*# National Aeronautics and Space Administration, Washington, D. C.

DETERMINATION OF OXYGEN TENSION IN THE SUBCUTANEOUS TISSUE OF COSMONAUTS DURING THE SALYUT-6 MISSION

S. Baranski, R. Bloszczynski, M. Hermaszewski, J. Kubiczkowa, A. Piorko, R. Saganiak, Z. Sarol, F. Skibniewsky, J. Stendera, and W. Walichnowski Mar. 1982 8 p Transl. into ENGLISH from Postepy Astronaut. (Poland), v. 12, no. 4, 1979 p 75-80 Translation was announced as A80-30518 Transl. by Kanner (Leo) Associates, Redwood City, Calif.

(Contract NASw-3541)

(NASA-TM-76793; NAS 1.15:76793) Avail: NTIS HC A02/MF A01 CSCL 06P

A polarographic technique was used to measure the oxygen tension in subcutaneous tissue of the forearm of a cosmonaut prior to, after, and on the fourth day of a space mission performed by Salut-6. A drop in the oxygen exchange rate in the peripheral tissues during weightlessness was observed. The mechanisms of this change are studied, taking into consideration the blood distribution in the organism and microcirculation disorders reflected by a decreased blood flow rate in arterial-venous junctions. Author

N82-20865# Committee on Science and Technology (U. S. House).

NATIONAL TOXICOLOGY PROGRAM

Washington GPO 1981 189 p Hearing before the Subcomm. on Investigations and Oversight of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 32, 15 Jul. 1981

(GPO-85-397) Avail: Subcomm. on Investigations and Oversight

The activities, plans, and priorities of the national toxicology program are discussed. The aim of the program is to develop through research the scientific information needed to protect the public health from damage by exposure to hazardous toxic substances. The effectiveness of the program was discussed. Carcinogens, particularly asbestos, are discussed. Bioassays and other forms of analysis are evaluated. R.J.F.

N82-20866* National Aeronautics and Space Administration, Washington, D. C.

AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY (SUPPLEMENT 229)

Feb. 1982 44 p

(NASA-SP-7011(229); NAS 1.21:7011(229)) Avail: NTIS HC $7.00 CSCL 06E

This bibliography lists 109 reports, articles, and other documents introduced into the NASA scientific and technical information system in January 1982. Author

N82-20867# Army Engineer Topographic Labs., Fort Belvoir, Va.

A STUDY OF THE HUMAN VISUAL SYSTEM IN SUPPORT OF AUTOMATED FEATURE EXTRACTION Research Note, Sep. 1979 - Sep. 1980

Frederick W. Rohde Oct. 1981 34 p refs

(DA Proj. 4A1-61101-A-91D)

(AD-A109139; ETL-0271) Avail: NTIS HC A03/MF A01 CSCL 06/16

An in-depth study of the anatomy and architecture of the visual system was conducted. Signal processing along the visual pathway was analyzed. The functions of the major components of the visual system were studied and the number of neurons determined. A comparison of the visual system with a computer was made. The concept of a feature extraction system was developed and discussed. Author (GRA)

N82-20868# Integrated Sciences Corp., Santa Monica, Calif.

FEMALE AND MALE SIZE, STRENGTH AND PERFORMANCE: A REVIEW OF CURRENT LITERATURE

Mark D. Phillips, Anne Bogardt, and Ross L. Pepper San Diego, Calif. Naval Ocean Systems Center Oct. 1981 159 p refs

(Contract N00123-80-D-0104)

(AD-A109270; ISC-342-1; NOSC/CR-107) Avail: NTIS HC A08/MF A01 CSCL 06/14

The increase in female personnel utilization aboard ship has initiated a need to examine gender based differences in anthropometrics, biomechanics, psychophysical performance, physiological attributes and the relationship of these factors to the design of shipboard equipment and fittings. Literature in this area was examined by Ayoub et al (1978). The purpose of the present report was to update and extend the baseline established by Ayoub et al (1978) by examining current work. GRA

N82-20869# Thoratec Labs. Corp., Berkeley, Calif.

FABRICATION OF CARDIOVASCULAR DEVICES Annual Report, Jun. 1980 - May 1981

David J. Farrar, John H. Lawson, Keith E. Buck, Robert S. Ward, and Kathleen OConnor Apr. 1981 57 p refs

(Contract N01-HV-9-2906)

(PB82-120148; NIH-N01-HV-92906-2) Avail: NTIS HC A04/MF A01 CSCL 06L

The fabrication of components primarily related to left ventricular assist devices LVAD components, such as bladders, bodies, covers, pusher plates, cannulas, and valve housing were fabricated and the integration of Thoratec blood pumps and actuators developed. In addition, preparations were made for the fabrication of clinical quality ventricular assist devices. These activities included design drawings detailed fabrication procedures, boiling, and initial fabrication of pump components. Polymer processing and handling techniques during fabrication were improved and the test stations were modified for life tests of seamless bladder LVADs. GRA

N82-20870# Tracor Jitco, Inc., Rockville, Md.

ENVIRONMENTAL AND HEALTH ASPECTS OF CHLOROFORM: A COMPREHENSIVE BIBLIOGRAPHY OF PUBLISHED LITERATURE, 1930 - 1981

Jun. 1981 311 p

(Contract EPA-68-01-5836)

(PB82-110115; EPA-560/7-81-011) Avail: NTIS HC A14/MF A01 CSCL 06T

The citations were selected from a thorough literature search, and broadly classified as having primarily environmental or biological emphasis. The sources used in the search are identified, and for the portion performed on line, the search strategies are also included. GRA

N82-20837# Joint Publications Research Service, Arlington, Va.

STRESS AND BIOLOGICAL RHYTHMS

S. I. Stepanova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 2025 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 16-20 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

N82-20838# Joint Publications Research Service, Arlington, Va.

RESULTS OF STUDIES OF COSMONAUTS' VESTIBULAR FUNCTION AND SPATIAL PERCEPTION

I. Ya. Yakovleva, L. N. Kornilova, I. K. Tarasov, and V. N. Alekseyev *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 26-33 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 20-26 (For primary document see N82-20834 11-51)

Avail: NTIS HC A07/MF A01

N82-20839# Joint Publications Research Service, Arlington, Va.

PROBABILITY OF CAISSON DISEASE AFTER PRESSURE DROP FROM 840 TO 308 MM Hg

A. S. Barer, M. I. Vakar, G. F. Vorobyev, L. R. Iseyev, S. N. Filipenkov, and V. I. Chadov *In its* USSR Rept.: Space Biol.

and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 34-37 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 26-28 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

N82-20840# Joint Publications Research Service, Arlington, Va.
ION REGULATING FUNCTION OF HUMAN KIDNEYS DURING LONG-TERM SPACE FLIGHTS AND IN MODEL STUDIES
A. L. Grigoryev, B. R. Dorokhova, G. S. Arzamazov, and B. V. Morukov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 38-44 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 29-33 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

N82-20841# Joint Publications Research Service, Arlington, Va.
STRUCTURAL AND FUNCTIONAL PROPERTIES, AND ENERGY METABOLISM OF ERYTHROCYTES DURING SPACE FLIGHTS VARYING IN DURATION
A. S. Ushakov, G. I. Kozinets, S. M. Ivanova, and V. P. Matviyenko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 45-50 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 34-37 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

N82-20842# Joint Publications Research Service, Arlington, Va.
POSITIVE PRESSURE BREATHING AS A MEANS OF PREVENTING ADVERSE REACTIONS TO ANTIORTHOSTATIC POSITION
V. G. Voloshin, V. A. Karpusheva, B. F. Asyamolov, R. A. Bondarenko, and V. S. Panchenko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 51-54 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 38-40 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

N82-20843# Joint Publications Research Service, Arlington, Va.
RELATIONSHIP BETWEEN MICROFLORA AND IMMUNITY OF COSMONAUTS CARRYING STAPHYLOCOCCUS AUREUS IN THE NASAL CAVITY
T. N. Nikolayeva, Ye. V. Guseva, R. Yu. Tashpulatov, and G. D. Syrykh *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 55-58 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 40-43 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

N82-20849# Joint Publications Research Service, Arlington, Va.
SIGNIFICANCE OF BONE DENSITY TO SPINAL TRAUMA RELATED TO PILOT EJECTION
A. P. Kozlovskiy, G. P. Stupkov, V. P. Dryannykh, A. B. Arsentyev, and V. V. Chuntul *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 87-89 refs Transl. into ENGLISH form Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 62-63 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

N82-20850# Joint Publications Research Service, Arlington, Va.
SIGNIFICANCE OF VESTIBULAR ASYMMETRY TO GENESIS OF VESTIBULAR DYSFUNCTION
V. A. Kislyakov and Yu. K. Stolbkov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 90-94 refs Transl. into ENGLISH from Kosm. Biol. Avaikosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 64-67 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

N82-20851# Joint Publications Research Service, Arlington, Va.
OPTOKINETIC FACTORS AND DEVELOPMENT OF SEASICKNESS SYMPTOMS
L. N. Kornilova, V. A. Shakhiyeva, and I. Ya. Yakovleva *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 95-99 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 67-70 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

N82-20853# Joint Publications Research Service, Arlington, Va.
COMPARATIVE EVALUATION OF PRESSURE CHAMBER CONDITIONING AND MAN'S ADAPTATION TO HYPOXIA AT HIGH ALTITUDE
A. Yu. Katkov, R. N. Chabdarova, N. V. Pravetskiy, S. A. Vtoryy, V. V. Lenskiy, and A. A. Titov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 107-110 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 74-77 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

N82-20858# Joint Publications Research Service, Arlington, Va.
SEROTONIN AND HISTAMINE METABOLISM IN COSMONAUTS
Z. S. Dolgun, S. A. Meshcheryakova, M. S. Belakovskiy, and V. I. Legenkov *In its* USSR Rept.: Space Biol. and Aerospace Med. Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 130-133 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 89-91 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N82-20871# Navy Personnel Research and Development Center, San Diego, Calif.
COMPUTER-MANAGED INSTRUCTION IN NAVY TECHNICAL TRAINING: AN ATTITUDINAL SURVEY Final Report, Jun. 1980 - Mar. 1981
Carol Ann Robinson, Elizabeth A. Tomblin, and Archester Houston Dec. 1981 53 p refs
(AD-A109664; NPRDC-TR-82-19) Avail: NTIS HC A04/MF A01 CSCL 05/9

Relatively little reliable data exist concerning the attitudes of students and instructors toward computer-managed instruction. This study attempted to determine attitudes of students and instructors and to identify factors related to these attitudes. It was found that students were favorable toward CMI while instructors were generally not favorable. Also, the trainee's experiences with the Navy are related to attitudes toward the CMI system. The longer the trainee is in the service, the more negative the individual tends to be toward the system.
Author (GRA)

N82-20872# Naval Postgraduate School, Monterey, Calif.
AN EVALUATION OF THE EFFECTIVENESS OF COLOR CODED TACTICAL SYMBOLOGY APPLIED TO MILITARY MAPS M.S. Thesis
Peter Kafurke Sep. 1981 88 p refs
(AD-A109675) Avail: NTIS HC A05/MF A01 CSCL 05/1

This thesis examined the effect of using color coded tactical symbology on military maps. It reviewed the basic aspects of color coding techniques and described a task paced experiment in which conventional monochrome (blue vs. red) coding techniques were compared to multiple color coding. The multicolor coded stimuli used were 5 standard symbols representing Artillery, Armor, Infantry, Mechanized Infantry and Engineers. The symbols were coded red, green, blue, orange and black respectively. The analysis of the data obtained from 20 subjects revealed that performance under multicolor coding condition was significantly superior with respect to response time, accuracy of response and accuracy of location transfer onto a copy of the displayed map. Author (GRA)

N82-20873# Maryland Univ., College Park. Computer Science Center.

RELATIVE DEPTH AND LOCAL SURFACE ORIENTATION FROM IMAGE MOTIONS

K. Prazdny Jan. 1981 34 p refs
(Contract DAAG53-76-C-0138; DARPA Order 3206)
(AD-A109565; CSC-TR-996) Avail: NTIS HC A03/MF A01 CSCL 05/8

A simple mathematical formalism is presented suggesting a mechanism for computing relative depth of any two texture elements characterized by the same relative motion parameters. The method is based on a ratio of a function of the angular velocities of the projecting rays corresponding to the two texture elements. The angular velocity of a ray cannot, however, be computed directly from the instantaneous characterization of motion of a 'retinal' point. It is shown how it can be obtained from the (linear) velocity of the image element on the projection surface and the first time derivative of its direction vector. A similar analysis produces a set of equations which directly yield local surface orientation relative to a given visual direction. The variables involved are scalar quantities directly measurable on the projection surface but, unlike the case of relative depth, the direction of (instantaneous) motion has to be computed by different means before the method can be applied. The relative merits of the two formalisms are briefly discussed. Author (GRA)

N82-20874# Maryland Univ., College Park. Computer Vision Lab.

DETERMINING THE INSTANTANEOUS DIRECTION OF MOTION FROM OPTICAL FLOW GENERATED BY A CURVILINEARLY MOVING OBSERVER

K. Prazdny Feb. 1981 30 p refs
(Contract DAAG53-16-C-0138; DARPA Order 3206)
(AD-A109566; CSC-TR-1009) Avail: NTIS HC A03/MF A01 CSCL 05/8

A method is described capable of decomposing the optical flow into its rotational and translational components. The translational component is extracted implicitly by locating the focus of expansion associated with the translational component of the relative motion. The method is simple, relying on minimizing an (error) function of three parameters. As such, it can also be applied, without modification, in the case of noisy input information. Unlike the previous attempts at interpreting optical flow to obtain information about the three dimensional disposition of texture elements, the method uses only relationships between quantities on the projection plane. No 3D geometry is involved. Also outlined is a possible use of the method for the extraction of that part of the optical flow containing information about relative depth directly from the image intensity values, without extracting the 'retinal' velocity vectors. Author (GRA)

N82-20875# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

DISPLAY-CONTROL COMPATIBILITY IN 3-D DISPLAYS. 1: EFFECTS OF ORIENTATION

A. W. F. Huggins and David J. Getty 15 Nov. 1981 79 p refs
(Contract N00014-80-C-0750; NR Proj. 196-166)
(AD-A109491; BBN-4724) Avail: NTIS HC A05/MF A01 CSCL 09/2

The recent development of true volumetric displays, such as SpaceGraph, has raised questions about display-control relationships that cannot be answered from earlier work with 2-D displays. We measured the speed and accuracy of simple control decisions when the displayed object was presented in orientations rotated away from congruence with the control orientation. Reaction times were measured for identifying the marked face of a static cube, presented with SpaceGraph, as a function of how much the cube image was rotated away from congruence with fixed physical cube on which the observer responded, and which dimension of the display corresponding to the rotation axis. The following results were obtained: The fastest and most accurate identifications occurred when there was a simple direct spatial mapping between the display and the control for all orientations presented. Decision times made with this strategy were relatively unaffected by orientation; Marked display-control incompatibility was found under some specific conditions; and The shape of the decision time functions suggest that decision strategies involved both propositioned coding and mental rotation. Author (GRA)

N82-20844# Joint Publications Research Service, Arlington, Va.

CORRELATION BETWEEN INDIVIDUAL DISTINCTIONS OF FUNCTIONAL ASYMMETRY OF CEREBRAL HEMISPHERES AND PILOT PERFORMANCE

A. A. Gyurdzhian and A. G. Fedoruk *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 59-62 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 44 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

N82-20845# Joint Publications Research Service, Arlington, Va.

INFLUENCE OF ORIENTATION METHOD ON QUALITY OF PILOT'S SPATIAL ORIENTATION

V. V. Lapa and N. A. Lemeshchenko *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 63-68 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 63-68 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N82-20876*# Tulane Univ., New Orleans, La. Medical School.

GENETIC ENGINEERING POSSIBILITIES FOR CELSS: A BIBLIOGRAPHY AND SUMMARY OF TECHNIQUES Final Report

Emmett J. Johnson Mar. 1982 22 p refs
(NASA Order A-73308B)
(NASA-CR-166306; NAS 1.26:166306) Avail: NTIS HC A02/MF A01 CSCL 06C

A bibliography of the most useful techniques employed in genetic engineering of higher plants, bacteria associated with plants, and plant cell cultures is provided. A resume of state-of-the-art genetic engineering of plants and bacteria is presented. The potential application of plant bacterial genetic engineering to CELSS (Controlled Ecological Life Support System) program and future research needs are discussed. Author

N82-20877# Los Alamos Scientific Lab., N. Mex.

TESTING AND EVALUATION OF THE US NAVY SUPPLIED AIR SUIT

O. D. Bradley and James D. DeField Feb. 1981 42 p ref
(Contract W-7405-eng-36)
(LA-8727-MS) Avail: NTIS HC A03/MF A01

An airline type supplied air suit for use during the asbestos removal operations is discussed. This supplied air suit was submitted for testing and evaluation of the degree of protection provided. Testing was limited to (1) evaluating interior sound pressure levels, (2) evaluating integrity of air lines and connectors,

and (3) evaluating suit removal procedures. The testing was performed using a 16 cubic meter test chamber and a polydispersed dioctyl phthalate aerosol. Aerosol concentrations were measured with a light scattering photometer. The spunbonded olefin supplied air suit indicated protection factors in excess of 18K for all subjects tested and in all tests performed. R.J.F.

N82-20878*# University of Southern California, Los Angeles. Inst. for Technoeconomic Systems.
A STUDY OF INTERACTIVE CONTROL SCHEDULING AND ECONOMIC ASSESSMENT FOR ROBOTIC SYSTEMS Final Report
29 Jan. 1982 23 p refs
(Contracts NAS7-100; JPL-955332)
(NASA-CR-168652; JPL-9950-645; NAS 1.26:168652; ITEC-10-81) Avail: NTIS HC A11/MF A01 CSCL 05H

A class of interactive control systems is derived by generalizing interactive manipulator control systems. Tasks of interactive control systems can be represented as a network of a finite set of actions which have specific operational characteristics and specific resource requirements, and which are of limited duration. This has enabled the decomposition of the overall control algorithm simultaneously and asynchronously. The performance benefits of sensor referenced and computer-aided control of manipulators in a complex environment is evaluated. The first phase of the CURV arm control system software development and the basic features of the control algorithms and their software implementation are presented. An optimal solution for a production scheduling problem that will be easy to implement in practical situations is investigated. S.L.

N82-20879# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
HOMSIM: A SIMULATOR OF THREE-DIMENSIONAL HOMINOID DYNAMICS
H. Hatze and A. Venter Apr. 1981 56 p refs
(CSIR-SR-SWISK-23; ISBN-0-7988-2103-5) Avail: NTIS HC A04/MF A01

Model equations, and the FORTRAN IV computer program HOMSIM implementing these equations, of a 17 segment hominoid moving in three dimensional space are described. The motion is considered unconstrained and all external force (except gravity) and torque vectors acting on the 17 segments, as well as internal joint torques, must be specified by the user as input functions. Author

N82-20880# Aeronautical Research Labs., Melbourne (Australia).
A REVIEW OF AIRCRAFT CABIN CONDITIONING FOR OPERATIONS IN AUSTRALIA
Brian Rebbechi Oct. 1980 80 p refs
(AD-A109044; ARL/MECH-ENG-159) Avail: NTIS HC A05/MF A01 CSCL 13/1

A review is presented of aircraft cabin conditioning. This review has been undertaken because of the inadequate performance of many aircraft air conditioning systems in the hottest conditions encountered in Australia. The factors included in this study were the climatic conditions (both Australia and world-wide), human performance in hot conditions, the heat balance of aircraft cabins, cooling system performance, and specification of cabin environment control systems. It is concluded that climatic conditions in Australia are not severe in a world-wide context, and that there is no technological reason why the cabin conditioning systems of aircraft should be inadequate. Compliance with present RAAF specifications will provide an acceptable cabin environment for operation of aircraft in Australia. Author (GRA)

N82-20881# Naval Ocean Systems Center, San Diego, Calif. Man-Systems Interaction Div.
MODELS AND MOCKUPS AS DESIGN AIDS, REVISION A
N. J. Buchaca 29 Sep. 1981 123 p refs
(AD-A109511; NOSC/TD-266-Rev-A) Avail: NTIS HC A06/MF A01 CSCL 14/2

This report describes the application of models and mockups as design aids in initially determining or improving control panel layouts and equipment/compartment arrangements to facilitate personnel and personnel/equipment interactions during system operations and maintenance. The report describes how these models and mockups (M&M) have been used, types of M&M and their applications in various phases of the design development cycle, and finally, a description of the use of M&M for man-machine design and design improvements. Three appendices are included in the report and contain: (1) Descriptions of NOSC M&M applications; (2) Examples of M&M specifications; and (3) An M&M characteristics checklist to aid in the preparation of M&M specifications. Author (GRA)

N82-20882# Royal Aircraft Establishment, Farnborough (England).
A COMPARISON OF RAF AND ITALIAN AIRCREW: ANTHROPOMETRIC DATA
E. J. Lovesey London HMSO Nov. 1980 20 p refs
(RAE-TM-FS-367; BR77205) Avail: NTIS HC A02/MF A01

Means and standard deviations were taken from Hertzberg's anthropometric survey of Italian pilots and from a survey of 2,000 RAF aircrews. The results generally show that the Italian pilots have similar body and limb circumferences to RAF aircrews. The Italian linear dimensions are, however, considerably less than those of the RAF aircrews. These differences need to be taken into account when designing cockpit and rear cabin work stations. Author (ESA)

N82-20883# European Space Agency, Paris (France).
SYSTEM SIMULATION APPLIED TO THE EVALUATION OF DISPLAYS FOR GUIDANCE AND CONTROL
Uwe Teegen Sep. 1981 60 p refs Transl. into ENGLISH of "Moeglichkeiten der Systemsimulation zur Bewertung von Flugfuehrungsanzeigen", Rept. DFVLR-Mitt-79-10 DFVLR, Brunswick, Jul. 1979
(ESA-TT-659; DFVLR-Mitt-79-10) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 12.60

The development of displays for monitoring and controlling complex technical systems is facilitated by employing a computer simulation of the man machine system during the theoretical design phase. A simulation model for the manual control task is described which leads to a method for evaluating displays. The capabilities and applications of this simulation model to a pilot airplane system restricted to aircraft motion in the vertical plane and a two channel pilot model are presented. Results suggest that the model should be further developed. Author (ESA)

N82-20846# Joint Publications Research Service, Arlington, Va.
DYNAMIC OF NUTRITIONAL STATUS DURING SIMULATION OF LONG-TERM AIRCRAFT FLIGHTS
I. G. Popov, A. A. Latskevich, V. Ye. Potkin, P. A. Lozinskiy, I. A. Romanova, and L. I. Kolesnikova *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 69-76 refs Transl. into ENGLISH form Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 49-55 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

N82-20847# Joint Publications Research Service, Arlington, Va.
SOME FEATURES OF EVALUATION OF WORK CAPACITY AND FATIGUE IN HELICOPTER PILOTS
Yu. N. Kamenskiy *In its* USSR Rept: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1981 (JPRS-80323) 16 Mar. 1982 p 77-81 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 55-58 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

N82-20848# Joint Publications Research Service, Arlington, Va.
PHYSIOLOGICAL AND HYGIENIC RATING OF TRANSPORT HELICOPTER VIBRATION DAMPER
Yu. G. Matveyev and Yu. N. Kamenskiy *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 82-86 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 59-61 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

N82-20852# Joint Publications Research Service, Arlington, Va.
HUMAN TOLERANCE OF ROTATION AT DIFFERENT LEVELS OF HYPERGRAVITY
A. M. Genin, A. R. Kotovskaya, R. R. Galle, L. N. Gavrilova, and I. Yu. Sarkisov *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 16, No. 1, Jan. - Feb. 1982 (JPRS-80323) 16 Mar. 1982 p 100-106 refs Transl. into ENGLISH from Kosm. Biol. Aviakosm. Med. (Moscow), v. 16, no. 1, Jan. - Feb. 1982 p 70-74 (For primary document see N82-20834 11-51)
Avail: NTIS HC A07/MF A01

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

N82-20884*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LIFE IN THE UNIVERSE
John Billingham, ed. Jan. 1982 465 p refs Proc. of conf. held at Moffett Field, Calif., 19-20 Jun. 1979 Analytic primary previously announced in IAA as A82-22976; subsidiaries previously announced as A82-22977 through A82-23004 (NASA-CP-2156; A-8242; NAS 1.55:2156; LC-81-22350)
Avail: NTIS MF A01; SOD HC $8.00 as SN 033-000-0084-4 CSCL 06F
For abstract, see A82-22976

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.
For components see *33 Electronics and Electrical Engineering*.

N82-20885 Illinois Univ. at Urbana-Champaign.
HIGH PERFORMANCE, HIGH AVAILABILITY DISTRIBUTED PROCESSOR SYSTEMS Ph.D. Thesis
Timothy Chen Kuang Chou 1981 139 p
Avail: Univ. Microfilms Order No. 8127567
An optimal deterministic scheduling algorithm was designed which assigns tasks to processors for minimal execution time. Also a class of adaptive decentralized load sharing algorithms was defined and studied using both queueing models and a general distributed system simulator. These models are used to examine how distributed processor load sharing algorithms behave as a function of job arrival, job service, processor failure, processor repair and interprocessor communication times. Dissert. Abstr.

N82-20886 Carnegie-Mellon Univ., Pittsburgh, Pa.
ANALYSIS AND MODELING OF TRANSIENT ERRORS IN DIGITAL COMPUTERS Ph.D. Thesis
Stephen Roy McConnel 1981 130 p
Avail: Univ. Microfilms Order No. 8127355
Experimental data on transient errors from several digital computer systems are presented and analyzed. The systems for which data has been collected are the DEC PDP-10 series computers, the Cm* multiprocessor, and the C.vmp fault tolerant microprocessor. Statistical tests indicate that transient errors follow a decreasing hazard rate distribution. This is at variance with the standard assumption of constant hazard rates (exponential distribution) used in reliability modeling, and requires models of greater complexity for accurate results. Models of common fault tolerant redundant structures are developed using the Weibull distribution, which has a time-varying hazard rate. Both analytical and simulation models are used to analyze the differences between the reliabilities predicted by Weibull based transient error models and those predicted by exponential based models. The analysis indicates a significant difference between the models based on the exponential distribution and those based on the decreasing hazard rate Weibull distribution. Dissert. Abstr.

N82-20887 Michigan State Univ., East Lansing.
TDMP: A DATA FLOW PROCESSOR Ph.D. Thesis
George Henry Simmons 1981 130 p
Avail: Univ. Microfilms Order No. 8126552
A multiple processor computer structure with a higher bandwidth than comparable single processor machines yet more flexible than existing fixed array multiprocessors was investigated. The approach was to develop a model, simulate and then analyze a computer structure called TDMP (Time Division Multiple Processing). TDMP's have the following general properties: greater bandwidth than comparable single processor structures; less complex switching network than a crossbar switch interconnection network; more flexible than fixed array networks; full access and nonblocking interconnection capabilities among the processors; simply extended to pipeline operation; and, finally, amenable to VLSI circuit implementation. Dissert. Abstr.

N82-20888 Pennsylvania State Univ., University Park.
A UNIFIED SECURITY MODEL FOR DATA BASE AND OPERATING SYSTEMS Ph.D. Thesis
David Leon Spooner 1981 198 p
Avail: Univ. Microfilms Order No. 8129221
Data base management systems (DMBSs) are built as subsystems on top of an operating system (OS). This design approach leads to problems of reliability and efficient performance as well as forcing a duplication of functions between the DBMS and OS. A design approach is proposed which removes much of this duplication by defining independent subsystems used by both the DBMS and OS. Specifically, a I/O and file support subsystem and a security subsystem are defined. Both subsystems make use of a logical information model which models the stored information in secondary storage. The data base operating system organization and the logical information model are presented in detail. Design of the security subsystem is stressed throughout. The security subsystem is based on the access control model, and is extended with conditional predicates (Boolean expressions) to produce an access control model with content-dependent security policies. Dissert. Abstr.

N82-20889 Illinois Inst. of Tech., Chicago.
A METHODOLOGY FOR THE DESIGN AND ANALYSIS OF FAULT-TOLERANT OPERATING SYSTEMS Ph.D. Thesis
Marius Doru Soneriu 1981 168 p
Avail: Univ. Microfilms Order No. 8200433
A methodology for the design and analysis of operating systems which can perform their specified functions in the presence of hardware and software faults, called fault-tolerant operating systems (FTOS), is presented. The methodology covers the following main topics: modeling, time overhead analysis, comparative study of techniques for fault-tolerance, and reliability estimation. A general model for FTOS defined as a hierarchy of nested fault-tolerant machines is first presented. The model is obtained starting from a hierarchically structured conventional operating system. In order to transform it into a fault-tolerant system, each conventional machine is augmented with an error detection and recovery (EDR) mechanism, thus obtaining a corresponding fault-tolerant machine. The applicability of the model for fault-tolerant operations is demonstrated by using it to investigate methods for reducing the time overhead introduced by redundancy. A technique for fault-tolerance with low time overhead, called tandem, is presented. Finally, a method for estimating the reliability of FTOS is introduced. Dissert. Abstr.

N82-20890 California Univ., Berkeley.
COMPUTER BASED MANAGEMENT INFORMATION

SYSTEMS EMBODYING ANSWER ACCURACY AS A USER PARAMETER Ph.D. Thesis
Jacob Paul Morgenstein 1981 153 p
Avail: Univ. Microfilms Order No. 8200219

Clerical and decision support queries are considered. A management information system (MIS) which can provide users with approximate answers to decision support queries is discussed. Time rather than cost constraints are emphasized. The discussion is in terms of the relational model of data. The value of information as a function of its error and the time it is made available, and the cost of acquiring such information are examined. Such sampled access complements indexed access. A system, the query advisor, to aid the user in choosing which of a set of questions should be answered (assuming that there is a time constraint), and how accurately, is described. Algorithms for answering decision support queries are discussed. Using a randomized file organization for implementing the proposed sampling algorithms is discussed. Issues involved in randomizing a file are discussed, and tradeoffs between a randomized file and more ordered file organizations are noted. N.W.

N82-20891 Iowa State Univ. of Science and Technology, Ames.
A MULTIPROCESSOR COMPUTER ARCHITECTURE FOR DATABASE SUPPORT Ph.D. Thesis
Roger K. Shultz 1981 159 p
Avail: Univ. Microfilms Order No. 812886

The effects of certain computer architecture design principles upon the design of a back-end database machine architecture were assessed. The example computer architecture, referred to as REPT (RElational Processing Tree), was designed using the principles of multiple identical processing nodes, minimization of global knowledge, and ease of processing expansion. A binary tree communication topology was investigated for the implementation of relational algebra operations. An indirect search of the database was employed by distributing source relations across leaf node memories. Implementations of complex relational algebra expressions were discussed. Dissert. Abstr.

N82-20892# Massachusetts Inst. of Tech., Cambridge. Center for Information Systems Research.
A STUDY OF THE MULTICACHE-CONSISTENCY PROBLEM IN MULTI-PROCESSOR COMPUTER SYSTEMS
Tarek K. Abdel-Hamid and Stuart E. Madnick Sep. 1981 146 p refs
(Contract N00039-78-G-0160)
(AD-A109134; M010-8109-06; TR-6) Avail: NTIS HC A07/MF A01 CSCL 09/2

This paper is a report on an ongoing research project at the M.I.T. Sloan School of Management to study the multicache consistency problem in multi-processor computer systems. The nature of the consistency problem in multicache memory systems is briefly discussed, together with an explanation of the three common approaches proposed in the literature to handle it. A new solution to the problem, called the 'Common-Cache/Pended Transaction Bus' (CC/PTB) approach, is developed and discussed. The 'CC/PTB' approach attempts to minimize performance degradation by eliminating the overhead of maintaining cache consistency. Its two distinctive features are: (1) the conventional private cache per processor organization is replaced by one where a pool of cache modules is commonly shared by all processors; (2) the Pended Transaction Bus (PTB) is used as the interconnection protocol that connects the processors and the cache modules. The performance of the CC/PTB approach is evaluated using a highly detailed simulation model with favorable results.
Author (GRA)

N82-20893# Army Engineer Topographic Labs., Fort Belvoir, Va.
INTERACTIVE DIGITAL CORRELATION TECHNIQUES FOR AUTOMATIC COMPILATION OF ELEVATION DATA
F. Raye Norvelle Oct. 1981 44 p
(DA Proj. 4A7-62707-A-855)
(AD-A109145; ETL-0272) Avail: NTIS HC A03/MF A01 CSCL 09/2

A program using digital correlation techniques was implemented on the Digital Image Analysis Laboratory (DIAL) to extract elevation data automatically from stereoscopic pairs of digital images. The DIAL enables the operator to view on a display unit the stereoscopic model and the computed match point coordinates in 3-D using anaglyphic techniques. The match points are presented as 3-D profiles superimposed over the 3-D terrain model, and consequently, the operator can observe the compilation process, detect errors as soon as they occur, and inherent with the process to prevent the accumulation of error or to time the parameters as conditions warrant. The program is described in terms of the hardware, the algorithm, the operating procedures, and the examples of compiled areas. GRA

N82-20894# Arinc Research Corp., Annapolis, Md.
TECHNICAL SUPPORT TO DDGX DATA BUS SPECIFICATION WORKING GROUP Final Summary Report, 25 Aug. 1980 - 30 Oct. 1981
C. Lacijan and D. Kober Oct. 1981 96 p
(Contract N00173-79-C-0463)
(AD-A109607; Rept-1687-01-1-2561) Avail: NTIS HC A05/MF A01 CSCL 09/2

In support of the Naval Research Laboratory and Naval Sea Systems Command during the period 25 August 1980 through 30 October 1981, ARINC Research Corporation provided technical services to the Navy by serving as a member of the Data Bus Specification Working Group (DBSWG) chartered to develop a specification for the data-transfer network. This report describes the results of tasks undertaken by the DBSWG during this period. Author (GRA)

N82-20895# Naval Postgraduate School, Monterey, Calif.
STATISTICAL ANALYSIS SOFTWARE FOR THE TRS-80 MICROCOMPUTER M.S. Thesis
Robert Paul Isbell Sep. 1981 121 p refs
(AD-A109602) Avail: NTIS HC A06/MF A01 CSCL 09/2

The development of a statistical analysis package for the TRS-80 microcomputer is documented. The package is comprised of six interactive programs which are generally divided into topical areas. The major emphasis is on exploratory data analysis and statistical inference, however, probability and inverse probability distributions are also included. The programming language is TRS-80 Level II BASIC enhanced by the input/output commands available through the ESF-80 (Exatron Stringy Floppy) mass storage subsystem. With the modification of these few commands, the package is compatible with most floppy disk operating systems designed for the TRS-80 Model I or Model III microcomputers. This statistical analysis capability implemented on a relatively inexpensive system provides a useful tool to the student or the trained analyst without ready access to a mainframe computer system. GRA

N82-20896# General Systems Group, Inc., Salem, N.H.
THE STUDY OF THE TRANSFER OF INTERRUPTED COMPUTATIONS BETWEEN COMPUTERS AND SAEC-O USER'S MANUAL Final Report
Joel Trimble 30 Oct. 1981 57 p
(Contract N00014-80-C-0228)
(AD-A109851) Avail: NTIS HC A04/MF A01 CSCL 09/2

The project began as an effort to study the transfer of interrupted combinations between machines. Transferring an interrupted computation means moving a program and its execution environment from one machine to another, while the program is running and without having to restart the computations. There are both economic reasons and technical reasons for pursuing this goal. Suppose we have - as we do - implementations of a programming system on machines with different resources and different costs for their use. We want to use the cheapest machine with adequate resources for as long as possible. Only when we need a function or resource that is only available on another machine do we want to migrate to the other machine and then perhaps only for the duration of our use of that function or resource. To take the system of interest, the programming system ECL, and the machines presently available, the PDP10 and PDP11/70, can we for instance be computing on the PDP11 and, at some point, require more space than it provides. Or we may move the computation, or some part of it, to the PDP10, continue the computation there and possibly return to the PDP11, with the migration transparent to the user. Such a facility permits us to share resources in an economical fashion. GRA

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N82-20897 Illinois Univ. at Urbana-Champaign.
REAL-TIME PROGRAMMING WITH FAULT-TOLERANCE Ph.D. Thesis
Anthony Yu-Wu Wei 1981 130 p
Avail: Univ. Microfilms Order No. 8127728

Methodologies and mechanisms are developed for high level systems programming languages which facilitate programming real-time systems and fault-tolerant real-time systems. Some language requirements for fault-tolerant real-time programming are identified. PATH PASCAL, a locally developed system programming language, was chosen as a vehicle to experiment on proposed methodologies and mechanisms for programming fault-tolerant real-time systems. Recovery blocks and a deadline mechanism were incorporated into the PATH PASCAL language to aid fault-tolerant software design in real-time systems. Facilities for specification of timing constraints and estimate of execution times are provided in the language. A fault-tolerant real-time executive and a simulation of a satellite on-board computer system were programmed using deadlines in PATH PASCAL. The results show the potential of the fault-tolerant mechanisms in a high level language to describe time-critical real-time systems.
Dissert. Abstr.

N82-20898 Ohio State Univ., Columbus.
IMPROVEMENTS IN THE STYLE OF COMPUTER GENERATED NATURAL LANGUAGE TEXT Ph.D. Thesis
Paul Lincoln Juell 1981 300 p
Avail: Univ. Microfilms Order No. 8129027

A semantic analysis attempting improvement in the style of computer generated narrative is presented. The initial hypothesis that most stylistic properties can be dealt with by purely syntactic methods was abandoned. The solution to most of the problems limiting the style of computer generated text was determined to require dealing with the meaning of the sentence in the overall context of multiple sentence text. Certain features of better style are identified, and a representation of knowledge together with routines matched to the representation to produce better style text were produced. The phenomena examined are: conjunction, ellipsis, pronouns, audience models, focus, conversational implicature, adjective selection and ordering, proper names, and some miscellaneous points. Some solutions to these problems are proposed and illustrated with a working computer program. An important part of this work was the determination of the depth and types of semantic information required to support generation of the various style phenomena were determined using a semantic network including prototypes for each individual in the story generated. Their structure is described by hierarchies of time lines. This semantic information supports processes such as the generation of text with pronouns and conjunctions. The particular generation program used is an ATN program.
Dissert. Abstr.

N82-20899 California Univ., Berkeley.
SOFTWARE REQUIREMENTS ENGINEERING: EXPERIENCE AND NEW TECHNIQUES Ph.D. Thesis
Chong Woo Nam 1981 154 p
Avail: Univ. Microfilms Order No. 8200224

The software requirements development process is investigated. Activities from the initial conception of a system through the development of software requirements specification are described. A framework for software requirements engineering (SRE) is developed in a comprehensive manner with three interrelated subjects: context analysis, functional specifications, and design constraints. This includes functional architecture of systems, characteristics of good requirements specification, personnel involved in the process of analysis, and management guidelines that are effective even in complex environments. The SRE principles include formal definitions for system requirements, system function, system function decomposition, and the subsequent design. Here, decomposition is defined as a set of interacting sub-functions and requirements in terms of the primitive concepts of sequences of inputs and outputs, sequences of transformations, and performance indices.
Dissert. Abstr.

N82-20900*# Boeing Commercial Airplane Co., Seattle, Wash. Space and Military Applications Div.
SOFTWARE RELIABILITY: REPETITIVE RUN EXPERIMENTATION AND MODELING
Phyllis M. Nagel and James A. Skrivan Feb. 1982 125 p refs
(Contract NAS1-16481)
(NASA-CR-165836; NAS 1.26:165836; BCS-40366) Avail: NTIS HC A06/MF A01 CSCL 09B

A software experiment conducted with repetitive run sampling is reported. Independently generated input data was used to verify that interfailure times are very nearly exponentially distributed and to obtain good estimates of the failure rates of individual errors and demonstrate how widely they vary. This fact invalidates many of the popular software reliability models now in use. The log failure rate of interfailure time was nearly linear as a function of the number of errors corrected. A new model of software reliability is proposed that incorporates these observations.
Author

N82-20901# Los Alamos Scientific Lab., N. Mex.
EOSSCAN: A PROGRAM TO DISPLAY EQUATION-OF-STATE DATA
B. I. Bennett Mar. 1981 13 p refs
(Contract W-7405-eng-36)
(LA-8737-MS) Avail: NTIS HC A02/MF A01

EOSSCAN is a program to interactively compute various equation-of-state quantities from either the Los Alamos tabular library SESAME or from a variety of analytic formulae commonly used by Lawrence Livermore Laboratory. The results can be presented as printed output, or the program will generate a set of data files that can be manipulated and graphically displayed by several utility programs provided by Los Alamos National Laboratory Group T-4.
Author

N82-20902# Los Alamos Scientific Lab., N. Mex.
USER'S MANUAL FOR A PROCESS MODEL CODE
E. A. Kern and D. P. Martinez Mar. 1981 97 p ref
(Contract W-7405-eng-36)
(LA-8761-M) Avail: NTIS HC A05/MF A01

The MODEL code has been developed for computer modeling of materials processing facilities associated with the nuclear fuel cycle. However, it can also be used in other modeling applications. Sufficient information is provided for a potential user to apply the code to specific process modeling problems. Several examples that demonstrate most of the capabilities of the code are provided.
Author

N82-20903# Los Alamos Scientific Lab., N. Mex.
COMPUTING DIVISION. TWO-YEAR OPERATIONAL PLAN, FISCAL YEARS 1981 AND 1982
Robert H. Ewald, W. Jack Worlton, and Margery McCormick, ed. Feb. 1981 109 p
(Contract W-7405-eng-36)
(LA-8725-MS) Avail: NTIS HC A06/MF A01

A comprehensive planning guide for the computing division of the Los Alamos National Laboratory for fiscal years 1981 and 1982 is presented. Subjects discussed include critical issues, programmatic requirements, hardware plans, software projects, direct user services, research projects, and projections of future developments.
R.J.F.

N82-20904# National Inst. for Personnel Research, Johannesburg (South Africa).
SUPPLEMENT TO PERS 305 MATHEMATICAL EXPRESSIONS AND TABULATING
R. S. Hall Mar. 1981 112 p
(CSIR-SR-PERS-317) Avail: NTIS HC A06/MF A01

Instructions for setting up tabulations and mathematical expressions on an AM International 747 Typesetter are presented. The computer program described enables anyone with access to a digital computer terminal to carry out the bulk of the work of typesetting without requiring the specialized services of a typesetter operator. The layouts of the disks used for the 747 Typesetter are shown. Spacing and layouts for text entry

are demonstrated in parallel to examples of the finished copy.
J.D.H.

N82-20905*# Alabama Univ. in Huntsville. Dept. of Computer Science.
LOGIC SYNTHESIS FROM DDL DESCRIPTION Quarterly Progress Report, 1 Oct. - 31 Dec. 1979
Sajjan G. Shiva Jan. 1980 18 p refs
(Contract NAS8-33096)
(NASA-CR-161386; NAS 1.26:161386; PR-5) Avail: NTIS HC A02/MF A01 CSCL 09B

The implementation of DDLTRN and DDLSIM programs on SEL-2 computer system is reported. These programs were tested with DDL descriptions of various complexity. An algorithm to synthesize the combinational logic using the cells available in the standard IC cell library was formulated. The algorithm is implemented as a FORTRAN program and a description of the program is given.
T.M.

N82-20906# Kernforschungszentrum, Karlsruhe (West Germany).
INTERKAMA 1980: SHORT PAPER PRESENTATION AT THE SPECIAL EXHIBITION: APPLIED RESEARCH [INTERKAMA 1980: KURZVORTRAGSREIHE AUF DER SONDERSCHAU ANGEWANDTE FORSCHUNG]
Horst Hofmann Aug. 1980 399 p refs In GERMAN Exhibition at Karlsruhe, West Germany, 9-15 Oct. 1980 Sponsored by Bundesministerium fuer Forschung und Technologie
(KfK-PDV-187) Avail: NTIS HC A17/MF A01

Proceedings in data processing and computer supported development, construction, and finishing are presented. The following topics are discussed: programming language process and experimental realtime language (PEARL); advantages of modular portable Basic-PEARL user program library; signal concept in PEARL; digital adaptive control; the Siemens process system; application of robots; software techniques; realtime systems; digital control systems; structural design of control systems; digital simulation systems; multiprocessor control system; microprogramming; computer storage devices; integrated system of image sensors. For individual titles, see N82-20907 through N82-20938.

N82-20907# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Forschungszentrum.
THE PROGRAMMING LANGUAGE PEARL USED FOR DESCRIPTION AND DEVELOPMENT OF TECHNICAL PROCESSING [DIE PROGRAMMIERSPRACHE PEARL ALS KOMMUNIKATIONSMITTEL ZUR BESCHREIBUNG UND ABWICKLUNG VON TECHNISCHEN PROZESSEN]
A. Kurau *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 10 Aug. 1980 p 1-11 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The development and production of programming languages and their meaning to specific ways of communication is demonstrated. The characteristics of programming languages in the description and processing of technical processes is examined. Experiences in space technology with the process and experimental realtime language (PEARL) programming language are described.
Transl. by E.A.K.

N82-20908# Entwicklungsbuero Wulf Werum, Lueneburg (West Germany)
PORTABLE PEARL PROGRAMMING (COMPILERS, TEST SYSTEM, DATA STORAGE) [PORTABLES PEARL PROGRAMMIERSYSTEM (COMPILER, TESTSYSTEM, DATENBANKSYSTEM)]
Hans Windauer *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 21 Jul. 1980 p 12-19 In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The portable process and experimental realtime language (PEARL) programming system is discussed. The most important language elements implemented by PEARL and its language scope are enumerated. Components of PEARL programming system are outlined. The compiler translates PEARL programs from computer programs into assembler routines or storage codes. The user guide of the multifold compiler parameter is adjusted to the control. The test system of PEARL programs with multimodules for target and cross calculators and a realtime databank system for simultaneous access by PEARL programs and dialog users for joint data input are also described.
Transl. by E.A.K.

N82-20909# Stuttgart Univ. (West Germany). Inst. fuer Regelungstechnik und Prozessautomatisierung.
ADVANTAGES OF PEARL PROGRAMMING LANGUAGE [WELCHE VORTEILE BIETET DIE PROZESSRECHNERSPRACHE PEARL?]
E. Joho *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 28 Jul. 1980 p 20-26 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The process and experimental realtime language (PEARL), an up to date computer programming language is discussed. The PEARL system compiler, operating and running time system, test and user system, and their application to data processing are outlined. The requirements for such a programming language are: realtime language characteristics; communication between data and technical processing by input and output of processing data; to build a program system module in serial modification, and to be easy to operate. The language and fundamental concepts for the design of a PEARL programming system are presented.
Transl. by E.A.K.

N82-20910# Stuttgart Univ. (West Germany). Abt. Stromerzeugung und Automatisierungstechnik.
SETTING UP AND TESTING OF A MODULE STRUCTURED PORTABLE BASIC-PEARL USERS PROGRAM LIBRARY [AUFBAU UND ERPROBUNG EINER MODULAR STRUKTURIERTEN PORTABLEN BASIC-PEARL-ANWENDER-PROGRAMMBIBLIOTHEK]
E. Welfonder, T. Roehrich, and H. Sternad *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 30 Jul. 1980 p 27-40 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The setup of the basic process and experimental automation realtime language (PEARL) user programming library is discussed. The analog and digital raw data are prepared through program block diagrams and distributed as finished values in the processing data bank. Programming library features are: flexibility, pattern accuracy, documentation, test of programming block diagrams and possibilities for expansion. The input for processing software curve plotting, especially in the programming system design, cooling, and testing can be lowered by applying building blocks. A processing automation program can absorb a large number of these block diagrams.
Transl. by E.A.K.

N82-20911# Technische Univ., Berlin (West Germany). Prozessrechnerverbund-Zentrale.
SIGNAL CONCEPT IN PEARL: A METHOD FOR SYSTEMATIC HANDLING OF EXCEPTIONAL CONDITION PROBLEMS [DAS SIGNALKONZEPT IN PEARL: EINE METHODE ZUR SYSTEMATISCHEN, PROBLEMORIENTIERTEN BEHANDLUNG VON PROGRAMMAUSNAHMESITUATIONEN]
Herbert Brinkoetter and Klaus Nagel *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 11 Jul. 1980 p 41-48 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

Criteria for classifying programming exceptions were developed. Mechanics of the programming language for these predicted exception handlings are outlined. The signal concept was compared to the process and experimental automation realtime language (PEARL), as it is actualized in introducing and use of the programming language PEARL in different kinds of applications. The signal concept of the PEARL programming offers a useful supplementary means in systematic problem solving of exception situations and it satisfies the present requirements of the mechanisms for exception handling.
Transl. by E.A.K.

N82-20912# Technische Univ., Berlin (West Germany). Prozessrechnerverbund-Zentrale.
PUBS: UNIVERSAL BINDER SYSTEM FOR PEARL [PUBS: PEARL-ORIENTIERTES, UNIVERSELLES BINDER-SYSTEM]
Joerg Groesser *In* Kernforschungszentrum Karlsruhe G.m.b.H.

INTERKAMA 1980 21 Jul. 1980 p 49-56 In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The process and experimental automation realtime language (PEARL) universal binder system (PUBS) is another means of application in the PEARL programming development. Its task is to: combine many separated translated PEARL modules and screen the consistence of the modular intersection point; plot a systems table for the PEARL operation system, and organize codes and data from the PEARL programs for the memory range of the target calculation. Transl. by E.A.K.

N82-20913# Erlangen-Nuremberg Univ. (West Germany). Physikalishces Inst.
A COMPUTER-INDEPENDENT TRANSLATING TECHNIQUE FOR THE REAL TIME LANGUAGE PEARL USING A SIEMENS 310 [EINE RECHNERUNABHAEINGIGE UEBERSETZUNGSTECHNIK FUER DIE REALZEITSPRACHE PEARLE, ANGEWANDTE FUER EINE SIEMANS 310]
P. Holleczek *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 31 Jul. 1980 p 57-71 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The use of portable systems software components was examined. Realtime operations for minicomputers in computer independent translating techniques for realtime language PEARL, with the use of a Siemens 310 computer is outlined. A fast compiling system is demonstrated with the aid of language elements. It is shown that through the development of portable systems software the implementation of a compiling system is less necessary. Transl. by E.A.K.

N82-20914# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Regelungstechnik.
DIGITAL ADAPTIVE CONTROL. INTRODUCTION AND EXAMPLES [DIGITALE ADAPTIVE REGELUNG: EINE EINFUEHRUNG MIT BEISPIELEN]
R. Schumann *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 Jul. 1980 p 72-84 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

Digital parameter adaptive controls in combination with a recurring parametric evaluation procedure with a control synthesis procedure were demonstrated. It is shown how fast parameter adaptive control adjusts to an unknown method, and also how it adapts to time change proceedings. The parameter adaptive control can be applied to: independent calibration of fixed digital controls, and to control of nonlinear methods. Parameter adaptive control is also racommended for microcomputers.
Transl. by E.A.K.

N82-20915# Technische Hochschule, Darmstadt (West Germany). Inst. fuer Regelungstechnik.
DETECTION OF LEAKS IN GAS PIPELINES [LECKUEBERWACHUNG BEI ROHRFERNLEITUNGEN]
L. Billmann *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 Jul. 1980 p 85-97 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The correlation analysis method to detect and locate small leaks in pipelines was proposed. The leak detection method measures pressure and pressure flow at the beginning and at the end of the pipeline and detects and locates even the smallest leak. The correlation of pressure or flow signals is calculated to decrease the chance of breakdown effects. The procedure is applicable to pipelines with gaseous and liquid materials.
Transl. by E.A.K.

N82-20916# Siemens A.G., Karlsruhe (West Germany).
THE SIEMENS BUS PROCESS CONTROL [DAS SIEMANS PROZESSBUS - SYSTEM]
D. Janetzky *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 23 Jul. 1980 p 98-110 ref In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The function and architecture of the bus system in automation systems is reviewed. The bus architecture and its significance to the application of different automation systems, like output capacity, reliability, and input are discussed. The short range and remote bus structure is established and the multimaster bus control is examined. It is shown that the bus process system architecture enables the construction of redundant highly reliable data processing systems with linear charge curves as a function of number of users and transmitting radius.
Transl. by E.A.K.

N82-20917# Institut fuer Textiltechnik, Reutlingen (West Germany).
PROCESS CONTROL IN SPINNING MILLS [PROZESSTEUERUNG IN DER RINGSPINNEREI]
R. Guse *In* Kernforschungzentrum Karlsruhe G.m.b.H. INTERKAMA 1980 15 Jul. 1980 p 111-117 In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A01/MF A01

Automation in spinning mills is discussed. Data processing equipment was installed in the workplace of one spinner (a group of 10 spinning machines). The following arrangements were made for installation of a data processor set up to identify and count yarn breakage at the ring spinning machine and set up to regulate speed of rotations. The automation gives technical improvement and is received positively by the machinery operators. Automation replaces the manual calibration of machinery needs less frequent servicing, and production is increased.
Transl. by E.A.K.

N82-20918# Karlsruhe Univ. (West Germany). Lehrstuhl fuer Planungs- und Programmiertechniken fuer Prozessrechner.
AL: A TEXTUAL PROGRAMMING SYSTEM FOR ROBOTS IN INDUSTRY [AL - EIN TEXTUELLES PROGRAMMIER - SYSTEM FUER INDUSTRIEROBOTER]
C. Blume *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 3 Jul. 1980 p 118-132 In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

Problems in programming of industrial robots, which do not occur in normal data processing were examined. Because the robot has a starting, middle, and final point, it has to be programmed three dimensionally. Four programming methods for industrial robots are differentiated: (1) manual routines; (2) sequence checking routines; (3) teach in methods; and (4) textual routines. The advantages of textual programming as opposed to the nontextual methods are outlined.
Transl. by E.A.K.

N82-20919# Gesellschaft fuer Prozess-Steuerungs und Informationssysteme m.b.H., Berlin (West Germany).
PROJECT DOCUMENTATION AND SOFTWARE OUTLINE WITH BOIE [PROJEKT-DOCUMENTATION UND SOFTWARE-ENTWURF MIT BOIE]
Peter Winkler *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 12 Aug. 1980 p 133-145 In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The beam concentrated interactive drafting tool (BOIE) is a method for drafting beam structured software systems. The BOIE concept relates to the drafting structure as well as to the construction approach. The BOIE is a supporting tool in the plotting of a curve of hierarchical designs and fascilitates hierarchical procedures in designs. The BOIE concept is generally adequate and allows for more than only the design of software systems. The BOIE is a useful tool in project documentation, project planning, and progress control. Transl. by E.A.K.

N82-20920# AEG-Telefunken, Berlin (West Germany).
THE DSL DESIGN LANGUAGE SOFTWARE TECHNIQUE CREATED FOR A CONTROL PROBLEM [DIE DSL - SOFTWARETECHNIK - DARGESTELLTANHAND EINER STEUERUNGS-AUFGABE]
Hans-Juergen Ehling *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 Jul. 1980 p 146-158 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The DSL software technique is described. A model was designed to develop systematic software. The model is based on: (1) a system description scheme; (2) a DSL design language; (3) development method; and (4) a development aid. The DSL

language is a graphic mixture which is not based on a specific programming technique. The first accomplishment of the DSL development is the output of the closests image. It is designed in the form of the output backwards principle. The ADA rendezvous technique is used to aid in the development of the DSL design. An operating system with the rendezvous technique for the microprocessors is therefore a further aid in the DSL technique development. Transl. by E.A.K.

N82-20921# Gesellschaft fuer Elektronische Informationsverabeitung m.b.H., Aachen (West Germany).
DARTS: A DESIGN AID FOR THE PLANNING STAGE OF REAL TIME SYSTEMS [DARTS: EIN HILFSMITTEL FUER DEN ENTWURF VON ECHTZEITSYSTEMEN]
Hans Keutgen, Hans Paul Knippen, and Hans Meyer *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 Jul. 1980 p 159-166 In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The design aid for realtime systems (DART) another tool in designing software is described. The element describes the operating structure, data flow of data structures and the realtime behavior. The DART covers two tasks in the software development: design support for software systems in the rough and fine designs, and developmental documentation from the rough design to maintenance phase. The DART design model supports the modular techniques and the step by step improvements. Transl. by E.A.K.

N82-20922# Karlsruhe Univ. (West Germany). Inst. fuer Nachrichtenverarbeitung.
COMPUTER AIDED DESIGN OF DIGITAL CONTROL SYSTEMS [RECHNERGESTUETZTES ENTWERFEN VON DIGITALSTEUERUNGEN]
Hans Martin Lipp *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 25 Jul. 1980 p 167-174 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

Current trends in design techniques of digital control circuits are examined. The use of computer aided designs (CAD) are increasingly more important to satisfy the high demands for design quality and development time. Considerations in the design of digital controls are reviewed. The CAD system LOGE is a program for the synthesis of microprogrammed controllers. It aids the maxi and microcomputers and its function is to support microcomputations. It is found that the LOGE is an effective system for logic design automation. Transl. by E.A.K.

N82-20923# Siemans A.G., Brunswick (West Germany).
SSP: A METHOD FOR STRUCTURAL DESIGN OF CONTROL SYSTEMS FOR DISCRETE TECHNICAL PROCESSES [SSP, EINE METHODE ZUM STRUKTURIERTEN SYSTEMENTWURF VON STEUERUNGEN FUER DISKRETE TECHNISCHE PROZESSE]
Werner Gottschalk *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 Oct. 1980 p 175-188 In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The SSP is a method which distinguishes in the design of control systems between the functions which a system has to execute and the supplemental functions which yield to requirements of the related technique. It is shown that the performance of such a design is not always linear and cannot be executed directly. The advantage of the SSP is that the technical neutral function model simplifies the understanding between the two functions. The SSP uses data flow from the input of multiple functions to the output and is a carrier of function return. The use of performance over the data flow structure is the first step in a system design. The SSP is based on the automata theory. The function return is explained by the Petri nets theory. The Petri nets are distinguished from instance nets and called transition nets. Transl. by E.A.K.

N82-20924# AEG-Telefunken, Berlin (West Germany). Forschungsinst.
SIMULATION OF INDUSTRIAL ELECTRONICS INSTALLATIONS BY MEANS OF THE DIGITAL SIMULATION SYSTEM NETASIM [SIMULATION VON ANLAGEN DER LEISTUNGSELEKTRONIK MIT DEM DIGITALEN SIMULATIONSSYSTEME: NETSIM]
O. Mehring *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 Aug. 1980 p 189-193 In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

Simulation in computer aided design (CAD) methods with special emphasis on linear and complex systems like modern industrial electronic installations was examined. The digital computers perform an important function in the problem solving of digital simulation systems. The construction simulation system NETASIM was developed. The system contains a language to formulate simulation tasks in the form of a simulation program and a processing system. A simulation task in NETASIM and the treatment of a NETASIM program by the processing system are described. Transl. by E.A.K.

N82-20925# Beratende Ingenieure fuer Verkehrstechnik und Datenverarbeitung, Aachen (West Germany).
IPSYS: AN INTERACTIVE PROGRAM SYSTEM FOR THE PLANNING AND HANDLING OF SIGNAL PROGRAMS WITH A TRAFFIC COMPUTER [IPSYS: EIN INTERAKTIVES PROGRAMMSYSTEM ZUM ENTWERFEN UND BEARBEITEN VON SIGNALPROGRAMMEN AUF DEM VERKEHRSRECHNER]
Klaus Everts *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 Jul. 1980 p 194-207 In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

Central traffic computers in the optimization of signal control are discussed. The off-line program SBS (signal processing) is the basis for the development of the IPSYS program. The main tasks of the IPSYS program are: to automate the light signals; to automate the necessary consequential changes when signal program changes occur; to prevent errors in the safety system; to provide actual measuring values; and to provide fast and direct access to control. In the development of a IPSYS operation, utilization and the possibility for system extension are emphasized. Transl. by E.A.K.

N82-20926# Stuttgart Univ. (West Germany). Inst. fuer Regelungstechnik und Prozessautomatisierung.
CHARACTERISTICS, CONSTRUCTION AND USE OF EPOS, A SYSTEM FOR SPECIFICATIONS AND DESIGN [WAS IST EPOS? EIGENSCHAFTEN, AUFBAU UND ANWENDUNG DES SPEZIFIKATIONS- UND ENTWURFSSYSTEMS EPOS]
E. Joho *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 28 Jul. 1980 p 208-214 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The demands for software tools which support and systemize all stages in the creation of an automation system lead to the development of a design supported process oriented specification system (EPOS). The EPOS is a computer aided tool in projecting, developing, utilizing, maintenance and operation of an automation system. The EPOS is divided into five components. The package distribution system consists of an entrance station in which a target code applied to the package is read in, and seven distribution stations are organized in the shape of a full binary beam. The automation system of the package distribution produces a parallel package distribution which agrees with its target codes in a total of eight target stations. Transl. by E.A.K.

N82-20927# Technische Hochschule, Aachen (West Germany). Lab. fuer Werkzeugmaschinen und Betriebslehre.
MULTIPROCESSOR CONTROL SYSTEM MPST: DESIGN AND STRUCTURE [MEHRPROZESSOR-STEUERUNG (MPST) SYSTEMGEDANKE UND SYSTEMSTRUKTUR]
K. F. Baukloh, K. Werth, and D. Plasch *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 26 Jul. 1980 p 216-225 refs In GERMAN Prepared in cooperation with Stuttgart Univ. (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The multiprocessing system (MPST) operation circuit, a modular flexible control system, was developed. The universality of the microprocessor module which can be used in the mechanical engineering industry, enables economic reasonably priced computer series. Operating blocks are printed on standard microprocessor circuits which are used with the aid of a central

outlet control. The final outlet of the control is determined by productively assigned functions. The software generation system provides useful aids in writing proper software programs.
Transl. by E.A.K.

N82-20928# Stuttgart Univ. (West Germany). Inst. fuer Steuerungstechnik.
NUMERICAL CONTROL OF SPECIAL MACHINES WITH COMPONENTS FROM THE MODULAR MULTIPROCESSING CONTROL SYSTEM (MPST) [NUMERISCHE STEUERUNG VON SONDERMASCHINEN MIT KOMPONENTEN DES MODULAREN MEHRPROZESSOR-STEUERSYSTEMS (MPST)]
D. Plasch *In* Kernforschungszentrum Karlsruhe G.m.b.H INTERKAMA 1980 12 Aug. 1980 p 226-245 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

Basic hardware and software for a multiprocessing control system (MPST), of which many components are available on the open market, was developed. The MPST bus is identified by 16 bit data and 16 bit address buses with control leads, which enable the internal communication of multiprocessing modules. The construction of the necessary function blocks for numerical control are described. The hardware and software components from which a foundation is created for the construction of numerical special machine controls are shown. Transl. by E.A.K.

N82-20929# Nahr (Horst) G.m.b.H., Neustadt (West Germany).
MICROPROGRAMMING CONTROL FOR CENTERLESS GRINDING MACHINES [EINE MIKROPROZESSORSTEUERUNG FUER DAS CENTERLESS-DURCHANGSSCHLEIFEN]
Horst Nahr *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 30 Jul. 1980 p 246-252 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The centerless short circuit machine process control which overcomes opposing reliability and accomplishes the desirable high production accuracy even at the highest throughput rate was developed. The signals of the computing station occur in the control stage where they are converted into digital data. Measurements of the basic regulating algorithm are taken by the process control of the machine's followup device, it controls the sorting compiler and operates the other auxiliary functions. The centerless short circuit machine is a production method which satisfies the high demand for production accuracy in high volume throughput. Transl. by E.A.K.

N82-20930# Kernforschungsanlage, Juelich (West Germany). Zentrallabor fuer Elektronik.
A MULTIPROCESSOR APPROACH TO AUTOMATION OF QUALITY CONTROL [MEHRPROZESSOR-STEUERUNGSSYSTEM ZUR AUTOMATISIERUNG VON PRUEFSTAENDEN]
J. Schmidt, D. Abbott, B. Pothen (Pierburg Luftfahrtgeraete Union G.m.b.H.), and K. Zwoll *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 1 Aug. 1980 p 253-276 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

A multiprocessing control system in the automation of testing stops was proposed. The system distinguishes itself by its functional modular construction of the hardware and consoftware. The systems strong points are: a realtime operating system which conducts the intertask communication in the multiprocessing system, a testing language for the programming of the test run, and a software package with digital control and regulation functions. Transl. by E.A.K.

N82-20931# AEG-Telefunken, Seligenstadt (West Germany).
CONSTRUCTION FORMS OF CONTROL SYSTEMS WITH COMPUTER STORAGE DEVICES [REALISIERUNGSASPEKTE FUER SPEICHERPROGRAMMIERBARE STEUERUNGEN]
Rainer Quaas *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 30 Jun. 1980 p 277-290 In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The continued automation of computer storage device control systems and the development of the LOGSTAT control system are discussed. Important aspects and goals of the control systems are: standardization of hardware/software components; simplification of planning, projection, operation and management; reduction of production costs by new approaches and problem solving; adaptability and rigidity; and increased process action.
Transl. by E.A.K.

N82-20932# Technische Hochschule, Aachen (West Germany). Lab. fuer Werkzeugmaschinen und Betriebslehre.
PILOT DEVICE FOR LATHE OPERATIONS WITH ADAPTIVE CONTROL AND AUTOMATIC CUTTING SEQUENCING [PILOTANLAGE FUER DIE DREHBEARBEITUNG MIT ADAPTIVE CONTROL UND AUTOMATISCHER SCHNITTAUFTEILUNG]
F. Breuer *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 Aug. 1980 p 291-305 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

Adaptive control (AC) systems for finishing techniques which considerably optimize criteria in piece work on heavy machinery were developed. Adaptive control constraints (ACC) in machining are discussed. An adaptive control optimization (ACO) cost model is designed which allows optimal operating procedures. The application of AC systems is used mainly on numerical supported machinery. It is shown that use of AC in automatic cutting distribution produces increased automation and productivity.
Transl. by E.A.K.

N82-20933# Standard Elektrik Lorenz A.G., Stuttgart (West Germany). Forschungszentrum.
DETAM: SOFTWARE SYSTEM FOR PROCESS AUTOMATION WITH MICROPROGRAMMING AND DECISION TABLES [DETAM - EIN SOFTWARE-SYSTEM ZUR PROZESSAUTOMATISIERUNG MIT MIKRORECHNERN UND ENTSCHEIDUNGSTABELLAN]
S. Nestel and K. Schaper *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 17 Jul. 1980 p 306-320 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The decision table support for microcomputers (DETAM) system was developed. The DETAM consists of a decision table preparation system which is processed on a minicomputer development system, and on a realtime operation program. The storage location and run time requirements are chosen between three alternative processing algorithms and planning, and optimization goals of predicted run time and storage device are explained. The DETAM enables automatic processing of fractional tasks in software development. Transl. by E.A.K.

N82-20934# Karlsruhe Univ. (West Germany). Inst. fuer Prozessmesstechnik und Prozessleittechnik.
SUPERVISION OF WHEEL LOADING RATES OF RAIL VEHICLES IN OPERATION [UEBERWACHUNG DER RADLASTVERHAELTNISSE VON SCHIENENFAHRZEUGEN IM ROLLENDEN BETRIEB]
H. Kronmueller and G. Jost *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 25 Jul. 1980 p 321-330 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

High value estimated algorithms on wheel loads on rail transportation vehicles were examined. Dynamic wheel load components are often caused by track location errors. The carriage movement is described by six linked differential equations of the second order with constant coefficients. Wheel load signals are described by linear differential equations of the second order of stochastic exitation. The differential equations coefficients are different for many carriage types depending on loads. The disturbance variables depend on cruising speed. It is shown that in rotating parts the wheel load can be determined if the standard deviation is less than 2%. Transl. by E.A.K.

N82-20935# Institut fuer Kunstsoffverarbeitung, Aachen (West Germany).
TECHNICAL AND STRUCTURAL DESIGN OF SELF POSITIONING INJECTION CASTING MACHINES [SYSTEMTECHNISCHES GESAMTKONZEPT DER SELBSTEINSTELLENDEN SPRITZGIESSMASCHINE]

W. Bongardt, K. W. Plessmann, and G. Menges *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 29 Jul. 1980 p 331-357 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

A microcomputer system which is used in injection molding processes was developed. With newly adapted hydraulic controls the injection molding machine finds its optimal quiescent point automatically. The microprocessing system consists of three independent computers. The realtime operator is linked by analog and digital input/output units to the injection molding machine. Utilization software for the realtime and the optimization computer were also developed. The optimal control carries out an intensive computer time online optimization of the after pressure profile of the instruments' internal pressure. Both programs combined take the complete adjustment of the machine for the after pressure phase and are in position, especially by change of quiescent point caused by temperature interference to compensate and to keep the shaped part weight constant. Transl. by E.A.K.

N82-20936# Fraunhofer-Inst. fuer Informations- und Datenverarbeitung, Karlsruhe (West Germany).
INTEGRATED SYSTEM OF IMAGE SENSORS USED FOR VISUAL CONTROL AND PROCESS OPERATION [EIN BAUKASTENSYSTEM FUER BILDSENSOREN ZUR SICHTPRUEFUNG UND PROZESSSTEUERUNG]
E. Enderle *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 18 Jul. 1980 p 358-365 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

Optical sensors for industrial application and for identification in process operation are discussed. An integrated image sensor system which is used in visual control and processing operations was developed. Objects are recognized by their particular surfaces, contours, and perforations. In vertical illumination the binary picture of a three dimensional production piece dissociates into many aspects. A model is presented for interactive plotting of vertical illumination dissociated object binary pictures.
Transl. by E.A.K.

N82-20937# Institut fuer Kunstsoffverarbeitung, Aachen (West Germany).
DEVELOPMENT OF AN ADAPTIVE PROCESS CONTROL IN THE CABLE COATING PROCESS USING THE PROGRAMMING LANGUAGE PEARL [ENTWICKLUNG EINER ADAPTIVEN PROZESSFUEHRUNG DES KABELUMMATELLUNGS-PROZESSES UNTER VERWENDUNG DER PROZESSRECHNERSPRACHE PEARL]
F. Ramm *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 28 Jul. 1980 p 366-378 In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The process and experimental automation realtime language (PEARL) was developed to model cable wrapping processes requirements, operating mechanisms, and cable finishing processes. The processing program has the following advantages: (1) comfortable dialogue of input data; (2) extensive peripheral test program for installation and layout tests; (3) measurements and testing of processing volume; (4) regulation of seven temperature zones; (5) value regulation cost for all automatic control systems; (6) simple operation of equipment on control desk; (7) continuous phase record of equipment; (8) interference record during production; (9) operating record after each yield. It is concluded that the cable wrapping processing model is a substantial aid which guarantees avoiding low quality in the start up phase. Transl. by E.A.K.

N82-20938# Institut fuer Werkzeugmaschinen und Fertigunstechnik, Berlin (West Germany).
MICROPROCESSING FOR PENETRATION FORCE CONTROL IN DRILLING OPERATIONS [MIKROPROZESSORGESTEUERTE VORSCHUBKRAFTUERBERWACHUNG BEIM BOHREN]
G. Spur *In* Kernforschungszentrum Karlsruhe G.m.b.H. INTERKAMA 1980 8 Aug. 1980 p 379-391 refs In GERMAN (For primary document see N82-20906 11-61)
Avail: NTIS HC A17/MF A01

The automatic operation control for drilling operations is discussed. A microprocessor which measures signals on penetrating forces in drilling operations was developed. The chip removal in drilling can not be controlled optically and the penetration force is measured form forces in the main spindel bearing. Signal analysis is made by the microprocessor. The force signal procedure produces criteria confirming the machinery processing. The microprocessor controls loads, and detects and indicates malfunctioning of machinery. The signal evaluation programs contains also input recordings. Transl. by E.A.K.

N82-20939# Massachusetts Univ., Amherst. Dept. of Computer and Information Science.
DEVELOPMENT OF A PROGRAM TESTING SYSTEM Final Scientific Report, 1 Jun. 1977 - 30 May 1981
Lori A. Clarke 30 May 1981 19 p refs
(Grant AF-AFOSR-3287-77)
(AD-A108591; AFOSR-81-0803TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

Programmers have historically used testing to convince themselves and others that their software works. Although testing has limitations, as do other reliability methods, it has one major advantage: it is the only method in which the actual behavior of the software can be observed. Thus, errors or oversights in the supporting environment, including the available validation tools, translators, operating system, and hardware, may be detected. Moreover, the actual performance can be evaluated for efficiency and usefulness. GRA

N82-20940# Naval Ship Research and Development Center, Bethesda, Md. Computation, Mathematics and Logistics Dept.
THE EVEN-RHO AND EVEN-EPSILON ALGORITHMS FOR ACCELERATING CONVERGENCE OF A NUMERICAL SEQUENCE Final Report, 1976 - 1980
Robert P. Eddy Dec. 1981 63 p refs
(SR0140301)
(AD-A109445; DTNSRDC-81/083) Avail: NTIS HC A04/MF A01 CSCL 12/1

Two closely related algorithms are presented for extrapolating to the limit of a scalar sequence. One, the even-epsilon algorithm, is due to Wynn; it permits systematic calculation of the array of Shank's transforms or, equivalently, of the related Pade Table. The other, the even-rho algorithm, is closely related to the first and is also based on Wynn's work; however, it has different properties and has not enjoyed the same theoretical development. Singular rules and near-singular rules are developed for both algorithms to handle situations in which adjacent tabular entries are equal or nearly equal, leading to zero or very small divisors. Computer programs implementing these algorithms are given along with sample output. An appreciable amount of historical background material is included. Author (GRA)

N82-20941# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.
LINOPT: A FORTRAN ROUTINE FOR SOLVING LINEAR PROGRAMMING PROBLEMS
John W. Wingate 9 Oct. 1981 44 p refs
(AD-A109487; NSWC/TR-80-413) Avail: NTIS HC A03/MF A01 CSCL 12/1

This report documents a FORTRAN routine LINOPT for solving linear programming problems. Upper and lower bounds on all variables are permitted, and the dual problem includes as a special case linearly-constrained minimum l1-norm problems. Basic theory, the algorithm used, input-output procedures and examples of use are included. Author (GRA)

N82-20942# Naval Postgraduate School, Monterey, Calif.
IVONNE: AN INTERACTIVE NETWORK MODEL-BUILDING SYSTEM M.S. Thesis
Charles Stephen Burchinal Sep. 1981 59 p refs
(AD-A109600) Avail: NTIS HC A04/MF A01 CSCL 12/2

Fast and efficient mathematical programming routines have been developed for network flow problems, but due to their complexity the average manager or lay analyst does not possess the mathematical programming background required to construct the models or use the solution technology available. This problem is solved here by the development of an interactive network generating system designed to create, update, and solve a single-commodity network with only a minimal knowledge of

network structure and only a rudimentary mastery of computer terminal use. Author (GRA)

N82-20943# Naval Postgraduate School, Monterey, Calif.
MEASURING CONTROL STRUCTURE COMPLEXITY THROUGH EXECUTION SEQUENCE GRAMMARS
Bruce J. MacLennan Nov. 1981 29 p refs
(AD-A109551; NPS52-81-015) Avail: NTIS
HC A03/MF A01 CSCL 09/2

A method for measuring the complexity of control structures is presented. It is based on the size of a grammar describing the possible execution sequences of the control structure. This method is applied to a number of control structures, including Pascal's control structures, Dijkstra's operators, and a structure recently proposed by Parnas. The verification of complexity measures is briefly discussed. Author (GRA)

N82-20944# Stanford Univ., Calif.
VERIFYING THE ABSENCE OF COMMON RUNTIME ERRORS IN COMPUTER PROGRAMS Ph.D. Thesis - Harvard Univ., Cambridge, Mass., Jun. 1981
Steven Mark German Jun. 1981 181 p refs
(Contract MDA903-80-C-9159; ARPA Order 3423)
(AD-A109433; SU-STAN-CS-81-866; SU-PVG-19; CSL-TR-208) Copyright. Avail: Issuing Activity CSCL 09/2

The Runcheck verifier is a working prototype system for proving the absence of runtime errors such as arithmetic overflow, array subscripting out of range, accessing an uninitialized variable, and dereferencing a null pointer. Such errors cannot be detected at compile time by most compilers. Runcheck accepts PASCAL programs documented with assertions and proves that the assertions are consistent with the program and that no runtime errors can occur. GRA

N82-20945# General Electric Co., Arlington, Va. Information Systems Programs.
THE EFFECTS OF THE SYMBOLOGY AND SPATIAL ARRANGEMENT OF SOFTWARE DOCUMENTATION IN A MODIFICATION TASK
Sylvia B. Sheppard, John W. Bailey, and Elizabeth Kruesi Dec. 1981 66 p refs
(Contract N00014-79-C-0595; NR Proj. 196-160)
(AD-A109833; TR-81-388200-5) Avail: NTIS
HC A04/MF A01 CSCL 09/2

This report describes the fourth in a series of experiments to evaluate the effects of the format of software documentation on programmer performance. The current experiment examined performance on a modification task. Thirty-six professional programmers were presented with documentation for each of three modular-sized programs. Nine different documentation formats were prepared for each program. These formats varied along two dimensions: type of symbology and spatial arrangement. The type of symbology included normal English, abbreviated English and program design language (PDL). The spatial arrangement included sequential (vertical flow), branching (flowchart), and hierarchical (tree-like). The participants were required to implement a modification to each program. These modifications required a minimum of three to five lines of additional code which the participants inserted using a text editor. The program output was checked automatically and a message informed the participants whether the output was correct or incorrect. The participants were asked to continue working until the modification was completed successfully. The difficulty of the task was measured by the time required to successfully complete the modification and by the number of errors which appeared in the first submission of the modified program. Unlike the previous experiments in this series, the type of symbology did not have a strong effect on performance time. However, the results reflected the trend that appeared in the previous experiments: the more succinct the symbology, the better the performance. GRA

N82-20946# Intermetrics, Inc., Cambridge, Mass.
ADA INTEGRATED ENVIRONMENT. 1: DESIGN RATIONALE Interim Report, 15 Sep. 1980 - 15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 144 p refs
(Contract F30602-80-C-0291; AF Proj. 5581)
(AD-A109746; RADC-TR-81-357) Avail: NTIS
HC A07/MF A01 CSCL 09/2

The ADA Integrated Environment (AIE) consists of a set of software tools intended to support design, development and maintenance of embedded computer software. A significant portion of an AIE includes software systems and tools residing and executing on a host computer (or set of computers). This set is known as an ADA Programming Support Environment (APSE). This report describes the rationale of the design for a minimal APSE, called a MAPSE. The MAPSE is the foundation upon which an APSE is built and will provide comprehensive support throughout the design, development and maintenance of ADA software. The MAPSE tools described in this report include an ADA compiler, linker/loader, debugger, editor, and configuration management tools. The kernel (KAPSE) will provide the interfaces (user, host, tool), database support, and facilities for executing Ada programs (runtime support system). GRA

N82-20947# Massachusetts Computer Associates, Inc., Wakefield.
ADA INTEGRATED ENVIRONMENT. 1: SYSTEM SPECIFICATION Interim Report, 15 Sep. 1980 - 15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 35 p Prepared for Intermetrics, Inc.
(Contract F30602-80-C-0291; AF Proj. 5581)
(AD-A109745; RADC-TR-81-356) Avail: NTIS
HC A03/MF A01 CSCL 09/2

The ADA Integrated Environment (AIE) consists of a set of software tools intended to support design, development and maintenance of embedded computer software. A significant portion of an AIE includes software systems and tools residing and executing on a host computer (or set of computers). This set is known as an ADA Programming Support Environment (APSE). This system specification describes the basic design for a minimal APSE, called a MAPSE. The MAPSE is the foundation upon which an APSE is built and will provide comprehensive support throughout the design, development and maintenance of ADA software. The MAPSE tools described in this specification include an ADA compiler, linker/loader, debugger, editor, and configuration management tools. The kernel (KAPSE) will provide the interfaces (user, host, tool), database support, and facilities for executing Ada programs (runtime support system). GRA

N82-20948# Texas Instruments, Inc., Lewisville. Equipment Group.
ADA INTEGRATED ENVIRONMENT. 3: SYSTEM SPECIFICATION Interim Report, 15 Sep. 1980 - 15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 52 p
(Contract F30602-80-C-0293; AF Proj. 5581)
(AD-A109750; RADC-TR-871-359) Avail: NTIS
HC A04/MF A01 CSCL 09/2

The ADA Integrated Environment (AIE) consists of a set of software tools intended to support design, development and maintenance of embedded computer software. A significant portion of an AIE includes software systems and tools residing and executing on a host computer (or set of computers). This set is known as an ADA Programming Support Environment (APSE). This system specification describes the basic design for a minimal APSE, called a MAPSE. The MAPSE is the foundation upon which an APSE is built and will provide comprehensive support throughout the design, development and maintenance of ADA software. The MAPSE tools described in this specification include an ADA compiler, linker/loader, debugger, editor, and configuration management tools. The kernel (KAPSE) will provide the interfaces (user, host, tool), database support, and facilities for executing ADA programs (runtime support system). Author (GRA)

N82-20949# Computer Sciences Corp., Falls Church, Va.
ADA INTEGRATED ENVIRONMENT 2 Interim Report, 15 Sep. 1980 - 15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 170 p
(Contract F30602-80-C-0292; AF Proj. 5581)
(AD-A109747; RADC-TR-81-363) Avail: NTIS
HC A08/MF A01 CSCL 09/2

The ADA Integrated Environment (AIE) consists of a set of software tools intended to support design, development and maintenance of embedded computer software. A significant portion of an AIE includes software systems and tools residing and executing on a host computer (or set of computers). This set is

known as an ADA Programming Support Environment (APSE). The rationale of the design for a minimal APSE, called a MAPSE is discussed. The MAPSE is the foundation upon which an APSE is built and provides comprehensive support throughout the design, development and maintenance of ADA software. The MAPSE tools described in this report include an ADA computer, linker/loader, debugger, editor, and configuration management tools. The kernel (KAPSE) provides the interfaces (user, host, tool), database support, and facilities for executing ADA programs (runtime support system). Practical system design, the editor, and the debugger are discussed. GRA

N82-20950# Computer Sciences Corp., Falls Church, Va.
ADA INTEGRATED ENVIRONMENT. 2: SYSTEM SPECIFICATION Interim Report, 15 Sep. 1980 - 15 Mar. 1981
Griffiss AFB, N.Y. RADC Dec. 1981 49 p refs
(Contract F30602-80-C-0292; AF Proj. 5581)
(AD-A109749; RADC-TR-81-362) Avail: NTIS HC A03/MF A01 CSCL 09/2

The ADA Integrated Environment (AIE) consists of a set of software tools intended to support design, development and maintenance of embedded computer software. A significant portion of an AIE includes software systems and tools residing and executing on a host computer (or set of computers). This set is known as an ADA Programming Support Environment (APSE). This system specification describes the basic design for a minimal APSE, called a MAPSE. The MAPSE is the foundation upon which an APSE is built and will provide comprehensive support throughout the design, development and maintenance of ADA software. The MAPSE tools described in this specification include an ADA compiler, linker/loader, debugger, editor, and configuration management tools. The kernel (KAPSE) will provide the interfaces (user, host, tool), database support, and facilities for executing ADA programs (runtime support system). Author (GRA)

N82-20951# Woods Hole Oceanographic Institution, Mass.
COMPUTER PROGRAM TO PROCESS DATA FROM A DIRECT-CURRENT PLASMA-EMISSION SPECTROMETER
D. C. Bankston Oct. 1981 29 p
(Contract DE-AC02-81EV-10694; Grant NSF OCE-81-19056)
(DE82-003666; DOE/EV-10694/4) Avail: NTIS HC A03/MF A01

Data from a Spectraspan IIB spectrometer retrofitted with a Spectrajet III plasma excitation source were processed. The spectrometer is operated manually and determines only one element at a time. The program treats data for each element individually. Two of the spectrometer's performance characteristics tend to change gradually during normal operation: average blank count and analytical sensitivity. The program compensates for these variations. The program converts all data to logarithmic form before use in computation. This enables the calculation of statistically valid confidence limits about predicted analyte concentrations. The program consists of a main section, DCPEOES, and three external subroutines: BASELINE, SENSITIV, and XLNSQFT. The BASELINE compensates for any change in the average blank count, and SENSITIV corrects for any variation in analytical sensitivity. The XLNSQFT governs all correlation and prediction functions and has two interchangeable versions: first order and for second order correlation. DOE

N82-20952# Physical Research Lab., Ahmedabad (India).
A PROGRAMMING SYSTEM ON MAXIMUM ENTROPY SPECTRAL ANALYSIS
C. S. R. Murty 1981 24 p refs
(PB82-119108; PRL/TN-81-01) Avail: NTIS HC A02/MF A01 CSCL 09B

The data adoptive maximum entropy method of spectral analysis is described. Four ways of calculating the spectral estimates are presented. A general programming system was developed in FORTRAN 4 and tested on IBM 360/44. The system can be used to calculate power spectrum using any one of the four methods. The system is provided to determine the optimum prediction error filter (PEF), using either 'FPE' criterion or 'AIC' criterion or 'CAT' criterion. The system is designed to provide exact location of peaks along with its amplitude by calculating the spectral density at more number of frequency points in an iterative way, such that the ordinate of the peak is within some small percentage of the neighboring ordinates, at each of the approximate peaks originally calculated. Author (GRA)

N82-20953 California Univ., Berkeley.
LINGUISTIC PATTERN CHRACTERIZATION AND ANALYSIS Ph.D. Thesis
Christian Friedrich-Freksa 1981 189 p
Avail: Univ. Microfilms Order No. 8200105

A model for communicating about objects by means of verbal descriptions is described. A hierarchy of object description languages is developed to demonstrate the advantages of fuzzy languages for communication in complex environments. There is a trade-off between crisp and precise languages suitable for well-defined, small domains, and fuzzy imprecise languages suitable for ill-defined, complex domains. Messages in a language of the former type are determined mainly by definitions of vocabulary and rules which make up the language. In contrast, messages in a language of the latter type are determined by the particular domain and context in which they are used. A fuzzy language does not describe a particular object or point in a feature space but rather it describes a subspace of the feature universe. If this subspace contains only one element in the particular domain of discourse, the fuzzy description has crisp denotation. Dissert. Abstr.

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Includes computer networks.

N82-20954 Oregon State Univ., Corvallis.
A DISTRIBUTED LOCAL COMPUTER NETWORK: FISHNET (FACILITIES INTEGRATED IN A SHARED HABITAT NETWORK) Ph.D. Thesis
Yong Joong Kang 1982 247 p
Avail: Univ. Microfilms Order No. 8126229

The FISHNET (Facilities Integrated in a Shared Habitat), a communication subnet architecture utilizing a hybrid application of point-to-point and broadcast communications is described. A high degree of network performance is achieved through utilizing a dual bus structure: a data bus and a control bus. The data bus consists of a set of uni- or bidirectional direct links connecting unique pairs of nodes. Data is transfered via an arbitrary connection pattern of links dynamically established between network nodes by circuit switching. The control bus is a common bus on which all nodes may transmit data, receive data, and monitor control and acknowledgement responses of other nodes via message switching. A fully distributed routing and control algorithm allocates communication resources to communicating nodes. The FISHNET offers an environment in which the communication structure may easily be incrementally modified (and improved) by insertion and deletion of additional network components. Dissert. Abstr.

N82-20955 British Library Lending Div., Boston Spa (England).
STRUCTURE AND ORGANIZATION OF PROCESS COMPUTER SYSTEMS TAKING AN EXAMPLE THE CONTROL SYSTEM FOR THE TEXTOR FUSION EXPERIMENT
K. D. Miller and K. D. Mueller 24 Jun. 1981 35 p refs Transl. into ENGLISH of conf. paper from Process Control Meeting West Germany 1981 Conf. held in Munich, 9-11 Mar. 1981 (BLL-CTO-1934-(9091.9F)) Avail: British Library Lending Div. Boston Spa, Engl.

In fusion research, the process computer is used to control and monitor machines. As the size of experiments increases, the number of devices to be monitored and controlled increase, as does their distance from the control room. By using a process computer, it is relatively easy to transfer information from many devices to a few communication channels and display this information form distant points in the central room. S.L.

N82-20956# TRW Defense and Space Systems Group, Redondo Beach, Calif.
LONG RANGE PLAN FOR EMBEDDED COMPUTER SYSTEMS SUPPORT, VOLUME 2 Final Report, Dec. 1980 - Aug. 1981
Oct. 1981 343 p

(Contract F33600-79-C-0540)
(AD-A109381; TRW-34330-6005-UT-00-Vol-2; CDRL-05A-Vol-2) Avail: NTIS HC A15/MF A01 CSCL 05/1

The life cycle support of the ever increasing number of computer systems embedded in weapon systems is a major challenge to the Air Force. With continued operational and support emphasis on performance and responsiveness to a dynamic mission environment, significant enhancement of support capabilities for all categories of embedded computer systems is required. This report contains recommendations for acquiring such capabilities. Author (GRA)

N82-20957# Naval Postgraduate School, Monterey, Calif.
A MICROCOMPUTER-BASED NETWORK OPTIMIZATION PACKAGE M.S. Thesis
Richard Henry Duff Sep. 1981 131 p refs
(AD-A109599) Avail: NTIS HC A07/MF A01 CSCL 09/2

An important branch of mathematical programming is concerned with optimization in systems described by networks. This paper describes an integrated suite of advanced techniques for dealing with minimum cost network flow formulations. Written in Pascal and implemented on a microcomputer representative of current small computer technology (the APPLE II), this package places unprecedented modeling versatility and solution capability on the analyst's desktop. Able to solve small to medium size problems (3000 arcs or less) at reasonable speeds, programs to handle capacitated linear, nonlinear (convex separable), mixed integer and elastic ranged linear models in addition to comprehensive control and data management routines are included. Problem size and solution speed benchmarks are given for a variety of models. Author (GRA)

N82-20958# Lincoln Lab., Mass. Inst. of Tech., Lexington. Lab. for Computer Science.
COMMUNICATION RING INITIALIZATION WITHOUT CENTRAL CONTROL
Jerome H. Saltzer Dec. 1981 17 p refs
(Contract N00014-75-C-0661)
(AD-A109435; MIT/LCS/TM-202) Avail: NTIS HC A02/MF A01 CSCL 09/2

This short memorandum describes a novel combination of three well-known techniques: the combination provides a systematic way of initializing a local-area ring network without previous, static designation of a distinguished station. The result is a distributed algorithm that dynamically designates a distinguished station from among a group of stations whose ability to communicate is hampered by the fact that the ring is not yet initialized. An appendix describes how this approach could be implemented as part of the 10/Megabit/second (version 2) ring network currently being installed at the MIT Laboratory for Computer Science. Author (GRA)

N82-20959 Illinois Inst. of Tech., Chicago.
GENERALIZED CONTROL OF MULTIPLE STAGE INTERCONNECTION NETWORKS Ph.D. Thesis
Norman Chin-Hung Chan 1981 126 p
Avail: Univ. Microfilms Order No. 8200411

As the complexity of interconnection networks increases, sophisticated algorithms are needed to negotiate routing problems. A multiple stage rearrangeable network. Two types of environments are considered: (1) One-to-one permutation assignments; (2) Connection assignments under fan-out. Generalized algorithms for controlling multiple stage rearrangeable interconnection networks are also presented. In applications, such as the telephone exchange, only a few lines of the network require rerouting at a time. Aspects of local rearrangement, in which only small portions of the network are adjusted, were investigated. Execution speeds of the algorithms were calculated. Worst case performance of the proposed algorithms were derived. Depending on the structure of the network, the execution speed of the partial rearrangement algorithm is found to be independent of the size of the network. Application of a parallel processing element - The Content Addressable Memory - further optimized the performance of the rearrangement algorithms. Dissert. Abstr.

63 CYBERNETICS

Includes feedback and control theory.
For related information see also *54 Man/System Technology and Life Support.*

N82-20960 North Carolina Univ. at Chapel Hill.
THREE-DIMENSIONAL CUES FOR MOLECULAR COMPUTER GRAPHICS SYSTEM Ph.D. Thesis
James Sargent Lipscomb 1981 238 p
Avail: Univ. Microfilms Order No. 8125600

Techniques for enhancement of the perception of depth in three dimensional objects presented on a two dimensional display are considered. Programs for implementing a number of such techniques flexibly and efficiently including rotation intensity modulation and stereo were developed. These techniques are applied to the GRIP-75 molecular computer graphics system with which crystallographers fit proteins or nucleic acids to their electron density maps. Theories that motion decomposition pervades many aspects of our computer graphics guided manual manipulation that smooth rotation appears to be the single best depth cue available that a variety of multiple image effects, due to disparity between refresh and update rates, can plague moving pictures, that the good 3-D perception provided by stereo can hinder manipulation, and that achieving orthogonality among functions is important and difficult are presented. The graphics system employed is described. Dissert. Abstr.

N82-20961# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
TANDEM QUEUES WITH DEPENDENT SERVICE TIMES IN LIGHT TRAFFIC
Ronald W. Wolff (Calif. Univ., Berkeley) Mar. 1981 25 p refs
(CSIR-TWISK-203) Avail: NTIS HC A02/MF A01

Light traffic results, i.e., asymptotic behavior as server utilization approaches zero, are obtained for r single-channel queues in tandem with Poisson arrivals where the r service times of the same customer at different stations have an arbitrary joint distribution. A detailed analysis is presented for $r = 2$. Some general results are presented for $r = 3$; the same methods may be used for arbitrary $r > 3$. For arbitrary r, an expression for expected delay is obtained in the special case where the r service times of the same customer are equal. For exponential service, a simple closed form expression is obtained. For $r = 2$, it is shown that when service times are positively quadrant dependent, expected delay is greater than when service times are independent and independent cases is very large, particularly when r is large. M.G.

N82-20962# Stanford Univ., Calif. Dept. of Computer Science.
QUERY OPTIMIZATION BY SEMANTIC REASONING Ph.D. Thesis
Jonathan Jay King May 1981 126 p Sponsored in part by NSF, IBM and DARPA
(Contract N00039-80-G-0132)
(AD-A108735; SU-STAN-CS-81-857) Avail: NTIS HC A07/MF A01 CSCL 06/4

Reformulation (Problem solving), Relational data bases semantic query optimization, to select an efficient way to process a query expressed in logical terms from among the alternative ways in the physical database is discussed. Semantic query optimization is to produce: a semantically equivalent query that is less expensive to process than the original query. The transformations are limited to those that yield a semantically equivalent query. The knowledge used to transform a query is the same knowledge used to insure the semantic integrity of the data stored in the database. Semantic query optimization brings together query processing and database integrity. Transformations that preserve semantic equivalence for queries in the relational calculus and several classes of cost reducing query transformations for relational database queries are defined, and quantitative estimates of the produced improvements, based upon widely accepted models of query processing are provided. The design and implementation of a system that carries out semantic query optimization for an important class of relational database queries are discussed. E.A.K.

N82-20963# University of Southeastern Massachusetts, North Dartmouth. Dept. of Electrical Engineering.
A STUDY OF TEXTURE CLASSIFICATION USING SPECTRAL FEATURES
C. H. Chen and Gia-Kinh Young 4 Jan. 1982 16 p refs
(Contract N00014-79-C-0494)
(AD-A109408; SMU-EE-TR-82-1) Avail: NTIS HC A02/MF A01 CSCL 05/8

Prior spectral feature study was not successful because of inaccuracy in 2-D spectral estimation. In this report, a generalization of Lim-Malik method is used to accurately estimate the ring and wedge spectral features for classification of textural images with a typical performance of over 80 percent correct classification for six texture classes. The results compare favorably with other texture features but require less computation using iterative algorithm. Author (GRA)

N82-20964# Interactive Systems Corp., Littleton, Colo.
A HIERARCHICAL PATTERN EXTRACTION SYSTEM FOR HEXAGONALLY SAMPLED IMAGES Final Report, 1 Mar. - 1 Sep. 1981
Laurie D. Gibson and Charles T. Lenzmeier Oct. 1981 88 p refs
(Contract F49620-81-C-0039; AF Proj. 2304)
(AD-A108976; AFOSR-81-0845TR) Avail: NTIS HC A05/MF A01 CSCL 09/2

The objective of this research was to study the application of Generalized Balanced Ternary (GBT), a hierarchical coordinate system, and its related data structures to the problem of extracting line and area data (vectors) from rasterized images. GBT allows the pixels in an image to be aggregated over regions of different sizes. In the raster to vector process certain descriptors are calculated for these aggregates. They describe the general raster pattern within the aggregate region. Algorithms were developed to vectorize by examining the descriptors rather than the pixel data. The algorithms were implemented in software and tested on sample data. The results indicate this approach is promising and suggest ways to improve the algorithms. GRA

N82-20965# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Mathematics.
IDENTIFICATION OF HEREDITARY CONTROL SYSTEMS VIA APPROXIMATION TECHNIQUES Final Report, 1 Jun. 1978 - 30 Sep. 1981
John A. Burns and Eugene M. Cliff Nov. 1981 8 p refs
(Contracts DAAG29-80-C-0126; DAAG29-78-G-0125)
(AD-A109332; ARO-15561.14-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report investigates approximation techniques for identification of control systems governed by functional differential equations. The work was primarily concerned with retarded systems, although some effort was devoted to neutral systems. Throughout the research, the objective was the development of efficient computational algorithms for parameter estimation in linear and nonlinear hereditary systems. The investigations were based on state space formulations of hereditary dynamics, on corresponding approximation techniques and on finite difference methods. The results obtained are applicable to a large class of dynamical processes with memory, including certain aero-elastic problems, biological feedback systems, feedback control systems, visco-elastic problems and mechanical systems with retardation. GRA

N82-20966# Yale Univ., New Haven, Conn. Systems and Information Sciences.
APPLICATION OF ADAPTIVE TECHNIQUES TO PROBLEMS IN CONTROL AND COMMUNICATION Annual Report, 1 Oct. 1980 - 30 Sep. 1981
K. S. Narendra Jan. 1982 13 p refs
(Contract N00014-76-C-0017)
(AD-A109672) Avail: NTIS HC A02/MF A01 CSCL 12/2

It was decided at Yale in 1980 that the control problem should be reformulated with more realistic objectives, allowing less restrictive assumptions to be made regarding the plant. For example, in many situations, where the error between plant output and model output cannot be made to tend to zero asymptotically, a reasonable objective would be to assure the boundedness of the output error as well as all the signals in the adaptive loop. Such considerations eventually led to the study of bounded error adaptive control problems. Plants with nonlinearities, output disturbances and time-varying parameters fall into this category. The work that has been in progress during the past eighteen months at Yale is concerned with the development of procedures for stable identification and control of systems with various degrees of uncertainty. Direct and indirect control techniques for systems with many control inputs and parameters are being investigated and methods of combining different techniques to obtain improved performance in practical applications are being examined. GRA

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N82-20967# National Research Inst. for Mathematical Sciences, Pretoria (South Africa). Computer Science Div.
A SOLUTION TO THE HIDDEN KEY PROBLEM OF 3NF RELATIONAL SCHEMATA
W. L. vanNiekerk Feb. 1981 59 p refs
(CSIR-TWISK-188) Avail: NTIS HC A04/MF A01

Two approaches to conceptual relational data base design are reviewed and techniques for transforming a third normal form (3NF) relational schema into a representation suited to the target data base management system (DBMS) are developed. A relation in a 3NF schema may have not only a number of candidate keys, but in general also a number of hidden keys, corresponding to hidden functional dependencies spanned by the relation. A solution to this problem is proposed, using an approach that involves joins of relations in the 3NF schema. J.D.H.

N82-20968# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
AN ALTERNATIVE APPROACH TO NONLINEAR FILTERING
Y. Yavin Mar. 1981 35 p refs Sponsored in part by Control Data
(CSIR-TWISK-199) Avail: NTIS HC A03/MF A01

The nonlinear filtering problem is treated in two stages. First, an observer with a given structure, but with an undetermined gain matrix is constructed. Then a feedback gain matrix law is chosen in such a manner that V(dot;G) is maximized on a class of admissable gain matrices. Sufficient conditions on the maximizing gain matrix are derived. These conditions can be applied off-line and can be used in the design of the observers. Several examples are solved numerically. J.D.H.

N82-20969# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
ON THE GENERATION OF UPDATES FOR QUASI-NEWTON METHODS
Jacob Flachs Apr. 1981 44 p refs
(CSIR-TWISK-206) Avail: NTIS HC A03/MF A01

A unified technique for updating approximations to Jacobian or Hessian matrices subject to multiple secant relations and other linear constraints, including sparsity is presented. Using an operator weighted Frobenius norm, a family of updating formulae, including the Broyden, DFP, and BFGS updates, is found. Its independence of the choice of operator weight is described. When certain elements of the matrix to be approximated are known, the updating formulae are given explicitly if symmetry has not been assumed. If symmetry is assumed, a system the solution of which is the update is presented. This system is similar to that in the case where the nonweighted Frobenius norm is considered. A solution is proposed to a problem where a symmetric positive definite matrix is desired. J.D.H.

N82-20970# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A MULTIVARIATE ADAPTIVE DATA FITTING ALGORITHM
Michael Brannigan Apr. 1981 13 p refs
(CSIR-TWISK-207) Avail: NTIS HC A02/MF A01

A method for solving the problem of approximating a discrete

set of points in a multivariate setting using adaptive approximating families is presented. The user has to make a choice of the approximating family, the norm, and make assumptions about the distribution of errors. The criterion for selecting the best from the set of possible approximations is simple to apply and is derived from information-theoretic considerations. It is shown that under certain restrictive assumptions this method and that of generalized cross-validation are asymptotically equivalent. Numerical results are given to support the validity of the method. Author

N82-20971# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
INFINITELY SMOOTH CONVERGENCE OF DIFFERENCE SCHEMES
Elemer E. Rosinger Mar. 1981 12 p refs
(CSIR-TWISK-198) Avail: NTIS HC A02/MF A01

A class of linear partial differential equations including the heat equation, and a corresponding class of approximating linear difference schemes are considered. It is shown that under the usual stability conditions convergence takes place not only in respect of the values of the numerical and exact solutions involved but also of their arbitrary-order partial derivatives in the space variables. Author

N82-20972# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
A FAST CONVERGENCE METHOD FOR NONLINEAR DIFFERENCE SCHEMES BY DIAGONAL APPROXIMATION
Elemer E. Rosinger Mar. 1981 27 p refs
(CSIR-TWISK-201) Avail: NTIS HC A03/MF A01

A method of constructing approximating ordinary differential equations (ODE) for a wide class of systems of nonlinear evolution partial differential equations (PDE) is presented. The ODEs are constructed in such a way that difference schemes for the approximating ODEs exhibit a fast convergence to the exact solutions of the PDEs under consideration. J.D.H.

N82-20973# Analytical Technology Applications Corp., Sunnyvale, Calif.
AMBIGUITY SURFACE STATISTICS AND OVERCONTAINMENT Final Report
Joseph LaPointe, Jr. 30 Sep. 1981 117 p refs
(Contract N00014-80-C-0698; RR0140501)
(AD-A108762; ATAC-SV8007-1) Avail: NTIS HC A06/MF A01 CSCL 12/1

Cross correlation algorithms are used to detect a signal that is common to both channels. The current understanding of the performance of cross correlation algorithms is based on the assumption that the processing and signal bandwidths are equal. Under these conditions, it is well known that the signal to noise power ratio (SNR) required to achieve a desired performance decreases as the integration time increases. However, in practice, it is usually necessary to use a processing bandwidth that is larger than the signal bandwidth because the signal bandwidth or the signal center frequency are only known approximately. The detection performance of cross correlation algorithms is derived for the signal over-containment case. It is shown that the SNR can be decreased by increasing the signal overcontainment for small signal time bandwidth products. It is also shown that for moderate to large signal time bandwidth products, the SNR increases with increasing signal overcontainment, but that the SNR increases very slowly with increasing signal overcontainment. Image filtering algorithms can be used to enhance the features of an ambiguity surface and thereby improve the detection performance. The PFA at the output of these filters is easily related to the single cell threshold when the noise cells are independent. GRA

N82-20974# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
APPLICATION OF THE METHOD OF HARMONIC LINEARIZATION FOR INVESTIGATING SLIP MODES IN A DIGITAL TRACKING SYSTEM WITH VARIABLE STRUCTURE
Ye. Ya. Ivanchenko and V. A. Kamenev 4 Dec. 1981 12 p refs Transl. into ENGLISH from Izv. Vyssh. Uched. Zaved. Elektromekh. (USSR), no. 6, 1971 p 593-599
(AD-A109171; FTD-ID(RS)T-1258-81) Avail: NTIS HC A02/MF A01 CSCL 12/1

Applications of the Method of Linearization for investigating Slip Modes in a Digital Tracking System with Variable Structure are discussed. GRA

N82-20975# Analysis and Technology, Inc., North Stonington, Conn. Systems Research and Analysis Dept.
TARGET MOTION ANALYSIS WITH A PRIORI INFORMATION Final Report
Clare B. Billing, Jr. and Harold F. Jarvis, Jr. 19 Oct. 1981 125 p refs
(Contract N00014-80-C-0379; NR Proj. 274-302)
(AD-A109627; P-515-2-81) Avail: NTIS HC A06/MF A01 CSCL 12/1

The investigation of the value of incorporating a priori information into the TMA solution is continued in this study by computer simulations using an asymptotically optimum estimation procedure. Two modifications to the Maximum Likelihood and Maximum a Posteriori estimation methods for bearings only TMA are examined with a view toward their capability to improve numerical convergence of the solution during early parts of the problem. The modifications are made to develop procedures which optimally use all available measurements and information and to determine the true value of a priori information incorporated into an optimum procedure. The Gauss-Newton algorithm employed is modified such that at each solution iteration an optimum step is taken along the calculated direction. This is accomplished by a line-search minimization of the cost function (logarithm of the a posteriori density function). The previous procedure iterated towards a null in the linearized gradient of the density function using only step-size bounds. The other modification examined is the estimation of an observable (three-state) relative-motion solution during the first leg which is then combined with a priori information to obtain the full solution after a maneuver. In addition to the study of the above modifications, multisensor MLE and MAP procedures are developed which solve the TMA problem using bearing and frequency measurements without own-ship maneuvers. Simulations are run to ascertain the impact of range, speed, and center frequency a priori information on the numerical convergence and solution accuracy of the multisensor algorithm. GRA

N82-20976# Army Armament Research and Development Command, Watervliet, N. Y. Large Caliber Weapons Systems Lab.
METHOD OF SOLUTION FOR VARIATIONAL PRINCIPLE USING BICUBIC HERMITE POLYNOMIALS
C. N. Shen Nov. 1981 31 p refs Presented at the Conf. of Army Mathematicians, West Point, N.Y., 10-12 Jun. 1981
(AD-A109482; ARLCB-TR-81043) Avail: NTIS HC A03/MF A01 CSCL 12/1

In solving mixed boundary and initial value problems of a second order partial differential equation using spline functions, the computation may be simplified considerably if the variable in time can be truncated into arbitrary sections. Each section may have several node points for the spline functions in the time domain. This is true because we found from a previous paper that the initial value problem can be solved in one direction using variational principle and cubic Hermite Polynomials, without worrying about the conditions at the other end. The end conditions of the adjoint system can be adjusted according to the end conditions of the original system so that the bilinear concomitant is identically zero. This satisfies the variational principle. A bilinear form of the original and adjoint variables is employed in determining the coefficients of the variations of the functions and their first derivatives. There is no term involving the variations of any higher derivatives. A bicubic Hermite Polynomial spline function is used which gives continuity in the function and first partial derivatives in space or time, together with the mixed first partial derivative in space and time. Algorithm and procedure of computation are given. Author (GRA)

N82-20977# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.
UTILIZING COMPLEX-VALUES S-ARRAYS IN THE MODELING OF ARMA PROCESSES
Jeffrey D. Hart and Henry L. Gray Dec. 1981 29 p refs

(Contract N00014-75-C-0439)
(AD-A109533; TR-154) Avail: NTIS HC A03/MF A01 CSCL 12/1

The problem of estimating order, (p,q) of an ARMA (p,q) process is considered. An extension of the Gray, Kelley, and McIntire (1978) method of estimating (p,q) is proposed and shown to be particularly useful for processes whose spectra have a certain form. Simulated data is used to illustrate the usefulness of the extension. Author (GRA)

N82-20978# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.

A DENSITY-QUANTILE FUNCTION APPROACH TO ADAPTIVE LOCATION OR SCALE PARAMETER ESTIMATION

Randall L. Eubank Dec. 1981 32 p refs
(Contract N00014-75-C-0439)
(AD-A109637; TR-155) Avail: NTIS HC A03/MF A01 CSCL 12/1

Two adaptive estimation procedures are developed for location or scale parameter estimation through the use of the asymptotically best linear unbiased estimator based on sample order statistics. The two procedures differ in their use of the data to guide optimal order statistic selection and are, consequently, termed partially and fully adaptive to indicate the associated degree of guidance. The partially adaptive procedure is developed in a data summary framework, similar to that utilized in exploratory data analysis, which provides a computationally simple scheme for obtaining estimators with high guaranteed asymptotic relative efficiency. The partially adaptive approach can also be viewed as providing techniques for adaptive data summary construction. Author (GRA)

N82-20979# Wisconsin Univ. - Madison. Mathematics Research Center.

ON A FULLY NONLINEAR PARABOLIC EQUATION AND THE ASYMPTOTIC BEHAVIOUR OF ITS SOLUTIONS Technical Summary Report

J. Ildefonso Diaz (Universidad de Santander) Oct. 1981 34 p refs
(Contract DAAG29-80-C-0041)
(AD-A109437; MRC-TSR-2291) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper deals with the first boundary problem associated with the fully nonlinear equation u sub t = Min(thi, delta u) on the set omega x (0, infinity), where omega is a domain of R to the N power and thi(x) is a given obstacle such that thi > or = 0 on omega. Formulating the problem (occurring in heat control) as an Evolution Variational Inequality, H. Brezis obtained the existence and uniqueness of weak solutions in the space H sub 0 to the 1st (omega) as well as weak convergence to an unknown equilibrium point of the equation (when t goes to infinity). The strong convergence of the solution to the zero equilibrium point is shown here, provided the obstacle is positive and subharmonic. If in addition thi(x) > or = gamma > 0 then the asymptotic behaviour is completely described in the sense that the solution satisfies the linear heat equation u sub t = delta u on (T sub 0, infinity) x omega, T sub 0 being a finite time. To do this the results are first presented for strong solutions (that is, those which satisfy the equation a.e.). The fact that under more regularity on the initial datum the weak solution is also a strong one and certain useful comparison principles are proved by using the theory of accretive operators in Banach spaces. Author (GRA)

N82-20980# Stanford Univ., Calif. Dept. of Computer Science.

LARGE TIME STEP SHOCK-CAPTURING TECHNIQUES FOR SCALAR CONSERVATION LAWS

Randall J. LeVeque Jul. 1981 23 p refs
(Contract N00014-75-C-1132)
(AD-A109847; SU-STAN-NA-81-13) Avail: NTIS HC A02/MF A01 CSCL 12/1

For a scalar conservation law u sub t = f(u) sub x with f' of constant sign, the first order upwind difference scheme is a special case of Godunov's method. The method is equivalent to solving a sequence of Riemann problems at each step and averaging the resulting solution over each cell in order to obtain the numerical solution at the next time level. The difference scheme is stable (and the solutions to the associated sequence of Riemann problems do not interact) provided the Courant number nu is less than 1. By allowing and explicitly handling such interactions, it is possible to obtain a generalized method which is stable for nu much larger than 1. In many cases the resulting solution is considerably more accurate than solutions obtained by other numerical methods. In particular, shocks can be correctly computed with virtually no smearing. The generalized method is rather unorthodox and still has some problems associated with it. Nonetheless, preliminary results are quite encouraging. Author (GRA)

N82-20981# Stanford Univ., Calif.

RANDOM SEQUENTIAL PACKING IN EUCLIDEAN SPACE OF DIMENSIONS THREE AND FOUR AND A CONJECTURE OF PALASTI

B. Edwin Blaisdell and Herbert Solomon 27 Jul. 1981 19 p refs
(Contracts N00014-76-C-0475; NR Proj. 042-267)
(AD-A109693; SU-TR-304) Avail: NTIS HC A02/MF A01 CSCL 12/1

A conjecture of Palasti that the limiting packing density beta sub d is a space of dimension d equals beta superscript d where Beta is the limiting packing density in one dimension continues to be studied, but with inconsistent results. Some recent correspondence to this Journal, as well as some other papers, indicate a lively interest in the subject. In a prior study, we demonstrated that the conjectured value in two dimensions was smaller than the actual density. Here we demonstrate that this is also so in three and four dimensions and that the discrepancy increases with dimension. GRA

N82-20982# Stanford Univ., Calif. Dept. of Statistics.

FACTORING PROBABILITIES ON COMPACT GROUPS

Persi Diaconis and Mehrad Shashahani 2 Dec. 1981 21 p refs
(Contract N00014-76-C-0475; Grant NSF MCS-80-24649; NR Proj. 042-267)
(AD-A109663; SU-TR-312; SU-TR-178) Avail: NTIS HC A02/MF A01 CSCL 12/1

When can a probability P be factored as P1 * P2? This problem arises in efficient generation of pseudo random integers and permutations. It is thus natural to think of P defined on a group. We show that any strictly positive measure can be factored. The uniform distribution can be factored in a non-trivial way for any compact group having more than three elements. If it is required that U = P* P, then factorization is possible if and only if the group is not Abelian or the product of the quarternions and a finite number of two element groups. Author (GRA)

N82-20983# Argonne National Lab., Ill. Applied Mathematics Div.

PRECONDITIONED CONJUGATE GRADIENT METHOD FOR SOLVING A CLASS OF NON-SYMMETRIC LINEAR SYSTEMS

J. J. Dongarra, G. K. Leaf, and M. Minkoff Oct. 1981 22 p refs
(Contract W-31-109-eng-38)
(DE82-002516; ANL-81-71) Avail: NTIS HC A02/MF A01

A conjugate gradient preconditioning scheme for solving a certain system of equations which arises in the solution of a three dimensional partial differential equation is described. The problem involves solving systems of equations where the matrices are large, sparse, and nonsymmetric. DOE

N82-20984 North Texas State Univ., Denton.

THE STEEPEST DESCENT METHOD USING FINITE ELEMENTS FOR SYSTEMS OF NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS Ph.D. Thesis

Mou-yung Morris Liaw 1981 105 p
Avail: Univ. Microfilms Order No. 8128277

A general method for using finite elements in the steepest descent method is developed. The main application is to a partial differential equation for a transonic flow problem. It is also applied to Burger's equation. Laplace's equation and the minimal surface equation. The entire method is tested by computer runs which give satisfactory results. The validity of certain of the procedures used are proved theoretically. The theory is based upon the

calculation of a matrix representation of operators in the gradient of a certain functional. Systematic use is made of local interpolation functions. Some particular types of finite elements such as n-hypercube elements and isoparametric elements are considered in detail. The theory does not depend upon the dimension of finite elements, it is applicable to three dimensional elements.
Dissert. Abstr.

N82-20985 North Texas State Univ., Denton.
FINITE ELEMENT SOLUTIONS TO NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS Ph.D. Thesis
Craig Jackson Beasley 1981 59 p
Avail: Univ. Microfilms Order No. 8128258

A numerical algorithm is developed that produces finite element solutions for a broad class of partial differential equations. The method is based on steepest descent methods in the Sobolev space H sup 1 (omega). Although the method may be applied in more general settings, we consider only differential equations that may be written as a first order quasilinear system. The method is developed in a Hilbert space setting where strong convergence is established for part of the iteration. We also prove convergence for an inner iteration in the finite element setting. The method is demonstrated on Burger's equation and the Navier-Stokes equations as applied to the square cavity flow problem. Numerical evidence suggests that the accuracy of the method is second order. A documented lasting of the FORTRAN code for the Navier-Stokes equations is included.
Dissert. Abstr.

N82-20986 Texas Christian Univ., Fort Worth.
MONODIFFRIC DIFFERENTIAL EQUATIONS AND K-TH ROOTS OF MONODIFFRIC FUNCTIONS Ph.D. Thesis
Tahereh Daneshi 1981 97 p
Avail: Univ. Microfilms Order No. 8129924

A quotient field of monodiffric functions in the first quadrant is set up. With the aid of the elements of this field, called operators, monodiffric differential forms are converted into algebraic forms. The result is a solution to ordinary monodiffric differential equations by operators. Laplace transforms of monodiffric functions are introduced and developed and the concept of Fourier transform is defined. Laplace transforms not only provide a method for solving monodiffric differential equations, but also can be used for extension of a monodiffric function to the whole plane. A direct method analogous to that of continuous theory for solving monodiffric differential equations is developed. The theory of k-th roots of a monodiffric function on the whole complex plane is introduced and regions of existence of the k-th roots of any monodiffric function are given.
Dissert. Abstr.

N82-20579# Bayerische Akademie der Wissenschaften, Munich (West Germany).
FREE NETWORK ADJUSTMENT AND S-TRANSFORMATIONS
Jan VanMierlo *In its* Contrib. from the Federal Rep. of Ger. to the 17th Gen. Assembly of Intern. Union of Geodesy and Geophys. 1980 p 41-54 refs (For primary document see N82-20575 11-42)
Avail: NTIS HC A06/MF A01

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N82-20987 California Univ., Berkeley.
CONTRIBUTIONS TO ROBUST DESIGN AND ESTIMATION PROBLEMS Ph.D. Thesis
Ker-Chau Li 1981 101 p

Three topics involving model-robustness consideration are treated. The first topic is robust regression designs when the design space consists of finitely many points. The nearly linear regression problem when the assumed first degree model is contaminated by some small constant is studied. The second topic is the minimax property for randomized designs. In many commonly-used experimental design situations, where the assumed model is contaminated by some small function, which is assumed to be invariant under a suitable group of transformations, a 'stochastic' minimax property for many commonly-used randomization procedures is demonstrated, which generalizes and unifies some results of C. F. Wu (1979) on the same topic. The third topic is the minimax of the method of regularization of stochastic processes. The idea of smoothing-spline interpolation is generalized to propose an estimator for the mean function of a stochastic process. A minimax property of the proposed estimator is then demonstrated under the usual squared loss function.
Dissert. Abstr.

N82-20988 North Carolina State Univ. at Raleigh.
DEVELOPMENT AND APPLICATIONS OF THE QUANTILE REGRESSION ESTIMATION (QRE) PROCEDURE Ph.D. Thesis
Dale Paul Lifson 1981 144 p
Avail: Univ. Microfilms Order No. 8128536

A quantile regression estimation (QRE) procedure is developed in which sample quantiles are regressed on their asymptotic expectations. The regression equation for selected three parameter log normal (3PLN) quantiles is derived in terms of the asymptotic moment generating functions of corresponding standard normal quantiles. Since the asymptotic covariance matrix of the residual is a function of the unknown parameters, iteratively reweighted least squares (IRLS) estimation techniques are recommended. Similar regression procedures are derived for the 3-parameter log equicorrelated-normal and S sub B (four-parameter log normal) distributions. Also, a condition version of the QRE procedure is derived as an alternative to the unconditional QRE procedure when IRLS is deemed undesirable. Finally, the QRE procedure is shown to apply in a more straightforward fashion for most absolutely continuous distribution functions whose inverses are expressible in a closed form. The sampling behavior of quantile regression estimates was examined in relation to the behavior of local maximum likelihood estimates using generated 3PLN and S sub B samples of size 99 and greater. In all cases, the biases of each estimation procedure were small.
Dissert. Abstr.

N82-20989 California Univ., Berkeley.
OPTIMAL DESIGNS FOR COVARIANCE MODELS Ph.D. Thesis
Troya Josefa Lopes 1981 181 p
Avail: Univ. Microfilms Order No. 8200194

A linear model with one treatment at V levels and first order regression on K continuous covariates with values on a K cube is considered. The D criterion is used to judge the 'goodness' of any design for this model. Since this criterion is based on the determinant of the information matrix M(d) of a design d, upper bounds for M(d) yield lower bounds for the D efficiency of any design d in estimating the vector of all parameters in the model. We consider here only classes of designs d for which the number N of observation to be taken is a multiple of V, that is, there exists R > o = 2 such that N = V x R. Under these conditions, we first determine an upper bound on M(d) for equireplicated designs, i.e., for designs with equal number of observations per treatment level. This upper bound for M(d) is shown to depend on the congruences of N and V modulo 4.
Dissert. Abstr.

N82-20990 Kentucky Univ., Lexington.
THE ESTIMATION OF IMPLICIT FUNCTIONS OF PARAMETERS IN NONLINEAR REGRESSION MODELS Ph.D. Thesis
An-Ling Annie Lu 1981 134 p
Avail: Univ. Microfilms Order No. 8129750

An algorithm was developed for finding the least squares estimates of p unknown parameters in a constrained nonlinear model, i.e., y = F (theta) + e, subject to the k restrictions g(theta) = 0. This algorithm was developed to circumvent the usual procedure of obtaining an explicit functional representation for a subset of k parameters in terms of the remaining parameters. In general, a global reparameterization of this type need not exist. Also, for certain classes of nonlinear functions, f, the estimation procedure is simplified by increasing the dimension of the parameter space and introducing corresponding restrictions. This class includes linear combinations of exponentials. The

asymptotic normality of the least squares estimators is derived. In deriving the asymptotic properties of least squares estimators of parameters, it is assumed that there exists an explicit, local, functional relationship for the subset of k parameters in terms of the remaining parameters. Results are permitting convenient computation of both the least squares estimators of theta and the asymptotic variance matrices of these estimators. These results are used to derive similar properties for any differentiable function of the parameter estimators. Dissert. Abstr.

N82-20991 Southern Methodist Univ., Dallas, Tex.
STATISTICAL INFERENCE RELATED TO THE MEANS OF TWO NORMAL POPULATIONS WITH UNEQUAL VARIANCES Ph.D. Thesis
Hon Cheng Yeh 1981 116 p
Avail: Univ. Microfilms Order No. 8128583

Previous solutions to the problem of comparing the means of two normal populations with unequal variances are discussed and some solutions are developed and investigated. A certain class of statistics used in testing the equality of the two normal means are considered and the effect of variance heterogeneity on the distribution of these test statistics is studied. Since the two-sample t-test has well-known properties, the robustness of this test under violations of the homogeneity assumption is studied. Dissert. Abstr.

N82-20992 California Univ., Berkeley.
ASYMPTOTIC MINIMAX PROPERTY OF CERTAIN PROCEDURES IN SURVEY SAMPLING Ph.D. Thesis
Steve Ngim Yee 1981 136 p
Avail: Univ. Microfilms Order No. 8200312

The asymptotic minimax property was investigated in the context of sampling from finite populations. A superpopulation approach was taken throughout. The population values are considered realized outcomes of independent random variables with a common distribution belonging to some prespecified class of distributions. The object is to derive local asymptotic minimax (LAM) predictors of the population average and the population variance. To facilitate the asymptotic development, we envision a sequence of sample survey problems indexed by (n,N) where n is the sample size and N is the population size. Both n and N approach infinity, but in such a way that the sampling fraction n/N converges to some constant in(0,1). The main results this thesis can be stated as follows: The LAM predictors of the population average and variance are essentially the same as the LAM estimators, based on the sample already chosen, of the superpopulation mean and variance. It is in the way we define the risk function that the specifically finite-population prediction aspect of the problem is incorporated. Dissert. Abstr.

N82-20993 California Univ., Berkeley.
CONTINUOUS-TIME MARKOV DECISION PROCESSES Ph.D. Thesis
Shimon Friedman 1981 99 p
Avail: Univ. Microfilms Order No. 8200104

Continuous-time decision processes with Borel state and action spaces are considered. The selection of the action at each point in time determines the distribution of the process infinitesimally. Only deterministic memoryless policies are considered. Under any such policy the process is a Markov process of the pure-jump type. The problem of the construction of a pure-jump type Markov process from its infinitesimal generator is investigated. The continuous-time decision process is studied in both the infinite-horizon discounted case and the finite-horizon case. In both cases it is shown that a policy is optimal if and only if its expected return functions satisfies a certain optimality equation. Existence and properties of optimal and nearly optimal policies are investigated. The results are applied to certain continuous-time gambling models. In the infinite-horizon discounted case, the relation of the continuous-time decision process to the discrete-time and semi-Markov decision processes is explored. Dissert. Abstr.

N82-20994 North Carolina State Univ. at Raleigh.
GENERALIZED LEAST SQUARES ANALYSIS OF THE SPLIT-PLOT MODEL USING AN ESTIMATED VARIANCE-COVARIANCE MATRIX Ph.D. Thesis
Luis Leon Landois 1981 157 p
Avail: Univ. Microfilms Order No. 8128533

The use of generalized least squares to estimate the treatment effects using an estimated variance-covariance matrix is considered. Rao's (1979) minimum norm quadratic estimation (MINQE) and invariance with respect to translation of the fixed effects are principles used to obtain estimates of the variance components. It is shown that invariant unbiased MINQE of the two variance components converge in probability to their true values. This is used to establish asymptotic properties of the generalized least squares estimators. Alternate estimators are obtained by using an iterated invariant MINQUE and by imposing the side condition that the estimate of the split-plot component be non-negative. A method for estimating the degrees of freedom associated with estimated variances of linear constraints among the generalized least squares estimates of the fixed effects is developed. This permits the construction of tests of hypotheses about constraints among the fixed effects. A small simulation is included to check on the performance of the procedure. Dissert. Abstr.

N82-20995 University of South Florida, Tampa.
PARAMETER ESTIMATION: LINEAR DECREASING MEAN RESIDUAL LIFE FAILURE MODEL Ph.D. Thesis
Ina Parks Skelton Howell 1981 164 p
Avail: Univ. Microfilms Order No. 8128313

The linear decreasing mean residual life failure model is characterized by its two parameters, the maximum life expectancy and the reciprocal death rate. This failure model arises when the mean residual life given survival to a fixed time is assumed to be a linear decreasing function of time. Estimates of these two parameters are described and compared. The failure model was derived, and its mathematical properties were given. The nonparametric estimator of mean residual life is a function of the order statistics of the sample; hence, the distribution and moments of the order statistics were found for this model. From these moments, the mean and variance of the nonparametric estimator were obtained. Maximum likelihood estimation, method of moments, and linear regression were considered as methods of estimating the two parameters. Monte Carlo simulation was used to compare the estimators obtained. The estimates of the parameters obtained were used to estimate the mean residual life at various percentiles. These estimates were compared to the nonparametric estimates at these percentiles. Dissert. Abstr.

N82-20996*# Iowa State Univ. of Science and Technology, Ames. Engineering Research Inst.
A STUDY OF PARAMETER IDENTIFICATION Final Report
C. J. Herget and R. E. Patterson, III Mar. 1978 118 p refs (Contract NCA2-40501)
(NASA-CR-166299; NAS 1.26:166299; ISU-ERI-AMES-78267) Avail: NTIS HC A06/MF A01 CSCL 12A

A set of definitions for deterministic parameter identification ability were proposed. Deterministic parameter identifiability properties are presented based on four system characteristics: direct parameter recoverability, properties of the system transfer function, properties of output distinguishability, and uniqueness properties of a quadratic cost functional. Stochastic parameter identifiability was defined in terms of the existence of an estimation sequence for the unknown parameters which is consistent in probability. Stochastic parameter identifiability properties are presented based on the following characteristics: convergence properties of the maximum likelihood estimate, properties of the joint probability density functions of the observations, and properties of the information matrix. N.W.

N82-20997# Hampton Inst., Va. Dept. of Mathematics and Computer Science.
A DESCRIPTIVE STUDY OF THE APPLICATION OF ANALYSIS OF VARIANCE AND REGRESSION TECHNIQUES IN AN ERROR ANALYSIS PROGRAM FOR TEST DATA OBTAINED IN A 16 FOOT TRANSONIC TUNNEL M.S. Thesis
Daisy Williams Alston Apr. 1981 216 p refs
Avail: NTIS HC A10/MF A01

A mathematical model has been designed that used standard statistical techniques to perform an error analysis of wind tunnel test data. Three separate but dependent computer programs define the procedure necessary for the generation and manipulation of

the required data. By applying the methods of least squares, cubic splines, analysis of variance, and regression analysis, the programs calculate and compare experimental data with test control data. The solution of the problem reveals that the nature of the lift and drag coefficient data versus angle of attack vary linearly, therefore the equation of a straight line is sufficient to represent the data. To minimize the residual differences, a third order curve fit, which defines an equation that represents the experimental pressure coefficient data, is used. Calculation of the F-ratios determines the significant components of the 2 x 7 x 5 factorial design and indicates the independent variables that significantly reduce the error factor. M.G.

N82-20998# National Research Inst. for Mathematical Sciences, Pretoria (South Africa). Operations Research and Statistics Div.

A SET OF PROBABILITY PAPERS FOR THE GAMMA DISTRIBUTION

Charlotte Heymann and Douglas M. Hawkins May 1981 31 p refs

(CSIR-TWISK-195) Avail: NTIS HC A03/MF A01

A set of three probability papers for the gamma distribution is presented, corresponding to large, intermediate and small values of the shape parameter. Together these papers enable the user to test for fit and estimate the parameters for any set of data, grouped or otherwise, believed to follow a two parameter gamma distribution. These inferences are made from at most two plots, and goodness of fit may be tested either visually or from the easily computed Kolmogorov statistic. Author

N82-20999# Illinois Univ., Urbana. Computer-based Education Research Lab.

SPOTTING INCORRECT RULES IN SIGNED-NUMBER ARITHMETIC BY THE INDIVIDUAL CONSISTENCY INDEX

Kikumi K. Tatsuoka and Maurice M. Tatsuoka Aug. 1981 47 p refs

(Contract N00014-79-C-0752; NR Proj. 154-445; RR0420401)

(AD-A108189; RR-81-4) Avail: NTIS HC A03/MF A01 CSCL 12/1

A criterion-referenced test in which items are chosen from a single content domain requires a close examination of construct validity. The Individual Consistency Index (ICI) is effective in detecting anomalous response patterns resulting from some misconception(s). The subset obtained by deleting the responses which were spotted by ICI showed a higher unidimensionality. The same result was replicated by another dataset whose test was parallel but not identical to the previous one. Although computerized error diagnostic programs can identify misconceptions possessed by a student in very specific domain of arithmetic, ICI can be applicable to more general domains and detect possible candidates to route to the expensive error-diagnostic programs. GRA

N82-21000# Purdue Univ., Lafayette, Ind. Dept. of Statistics.

ISOTONIC PROCEDURES FOR SELECTING POPULATIONS BETTER THAN A CONTROL UNDER ORDERING PRIOR

Shanti S. Gupta and Hwa-Ming Yang (Toledo Univ.) Jul. 1981 49 p refs Presented at the Golden Jubilee Conf. of the Indian Statist. Inst., Calcutta, 15-20 Dec. 1981

(Contract N00014-75-C-0455)

(AD-A109288; MMS-81-24) Avail: NTIS HC A03/MF A01 CSCL 12/1

The problem of selecting a subset containing all populations better than a control under an ordering prior was considered. Three new selections procedures which satisfy a desirable basic requirement on the probability of a correct selection were proposed and studied. Two of the three procedures used the isotonic regression over the sample means of the k-treatments with respect to the given ordering prior. Tables of constants which are necessary to carry out the selection procedures with isotonic approach for the selection of unknown means of normal populations are given. The results including Monte Carlo studies indicate that, in general, the stepwise procedure delta sub 1, using estimators, is the best. Author

N82-21001# California Univ., Berkeley. Electronics Research Lab.

RESEARCH ON MULTIPARAMETER STOCHASTIC PROCESSES Final Report, 1 Sep. 1978 - 31 Aug. 1981

E. Wong 31 Aug. 1981 5 p refs

(Grant DAAG29-78-G-0186)

(AD-A109166; ARO-15748.6-M) Avail: NTIS HC A02/MF A01 CSCL 12/1

During the period of this grant, a number of problems on stochastic processes were studied. The principal achievements were: (1) The development of a theory of set-parametered martingales and an associated theory of stochastic integration. (2) The discovery of a class of nonlinear-filtering problems for which explicit solutions can be obtained. Author (GRA)

N82-21002# Department of the Army, Washington, D. C.

LEGITIMATE TECHNIQUES FOR IMPROVING THE R-SQUARE AND RELATED STATISTICS OF A MULTIPLE REGRESSION MODEL

Edwin J. Curle 1981 19 p refs Presented to the 16th Ann. Dept. of Defense Cost Analysis Symp., Arlington, Va., 4-7 Oct. 1981

(AD-A109370) Avail: NTIS HC A02/MF A01 CSCL 05/3

Cost and analysts and DOD contractors frequently use regression analysis to develop cost estimating relationships, production relationships, and various forecasting equations. Invariably, those regression equations are presented in the text of the final report along with the statistical properties i.e., the R-Square, the Standard Error of the Estimate, the Durbin-Watson Statistic. These statistics are often presented as evidence of the validity and accuracy of the resulting equation. The higher the R-square the bolder the print and the more prominently displayed. Unfortunately, high R-square's, favorable Durbin-Watson statistics, can be artificially or inadvertently inflated to appear more favorable. In reality, the equation with good statistical properties may not reflect a valid causal relationship to explain variations in the dependent variable. In many cases the regression equations prove to be of little value in forecasting or explaining the relationships with new data. This paper discusses techniques for artificially raising the R-square and related statistical properties of regression equations. These techniques are presented for the benefit of analysts who are trying to improve the statistical properties of their equations and for the benefit of managers who must approve payment for such analysis. Author (GRA)

N82-21003# Educational Testing Service, Princeton, N. J.

THE STANDARD ERROR OF EQUIPERCENTILE EQUATING

Frederic M. Lord Nov. 1981 31 p refs

(Contract N00014-80-C-0402; NR Proj. 150-453)

(AD-A108882; ETS-RR-81-48) Avail: NTIS HC A03/MF A01 CSCL 12/1

The standard error of an equipercentile equating is derived for four different situations. Some numerical results are checked by Monte Carlo methods. Numerical standard errors are computed for two sets of real data. Author (GRA)

N82-21004# Educational Testing Service, Princeton, N. J.

STANDARD ERROR OF AN EQUATING BY ITEM RESPONSE THEORY

Frederic M. Lord Nov. 1981 32 p refs

(Contract N00014-80-C-0402; NR Proj. 150-453)

(AD-A108875; ETS-RR-81-49) Avail: NTIS HC A03/MF A01 CSCL 12/1

A formula is derived for the asymptotic standard error of a true-score equating by item response theory. The equating method is applicable when the two tests to be equated are administered to different groups along with an 'anchor test.' Numerical standard errors are shown for an actual equating (1) comparing the standard errors of IRT, linear, and equipercentile methods; (2) illustrating the effect of the length of the anchor test on the standard error of the equating. Author (GRA)

N82-21005# Educational Testing Service, Princeton, N. J.

UNBIASED ESTIMATORS OF ABILITY PARAMETERS, OF THEIR VARIANCE, AND OF THEIR PARALLEL-FORMS RELIABILITY

Frederic M. Lord Nov. 1981 42 p refs

(Contract N00014-80-C-0402; NR Proj. 150-453)
(AD-A108874; ETS-RR-81-50) Avail: NTIS HC A03/MF A01 CSCL 12/1

This paper is primarily concerned with determining the statistical bias in the maximum likelihood estimate theta-carat of the examinee ability parameter Theta in item response theory (IRT) (Lord, 1980); also of certain functions of such parameters. We will deal only with unidimensional tests composed of dichotomously scored items. We assume the item response function is three-parameter logistic. Available results for the sampling variance of theta-carat are currently limited to the case where the item parameters are known; the present derivations are limited to this case also. This limitation is tolerable in situations where the item parameters are predetermined, as in item banking and tailored testing. In the absence of a prior distribution for theta, it is well known that examinees with perfect scores have Theta-carat = Infinity; also that examinees who perform near or below the chance level on multiple-choice items may be given large negative values of theta-carat. This (correctly) suggests that theta-carat is positively biased for high-ability examinees and negatively biased for low-ability examinees. Will a correction of theta-carat for bias be helpful in such cases? The methods used to derive formulas for correction for bias are presented here. GRA

N82-21006# Tennessee Univ., Knoxville. Dept. of Psychology.

EFFICIENT METHODS OF ESTIMATING THE OPERATING CHARACTERISTICS OF ITEM RESPONSE CATEGORIES AND CHALLENGE TO A NEW MODEL FOR THE MULTIPLE-CHOICE ITEM Final Report, 1 May 1977 - 30 Sep. 1981

Fumiko Samejima Nov. 1981 251 p refs
(Contract N00014-77-C-0360; NR Proj. 150-402; RR0420401)
(AD-A109141) Avail: NTIS HC A12/MF A01 CSCL 12/1

This is the final report for the research contract N00014-77-C-0360, which started on May 1, 1977, and end on September 30, 1981. It systemizes major findings of the research, and gives perspectives and directions of future research. GRA

N82-21007# Army Materiel Systems Analysis Activity, Aberdeen Proving Ground, Md.

AN EXTENSION TO THE WEIBULL PROCESS MODEL

Grady W. Miller Nov. 1981 16 p refs
(DA Proj. 1R6-65706-M-541)
(AD-A109713; AMSAA-TR-341) Avail: NTIS HC A02/MF A01 CSCL 12/1

A system testing program may consist of two kinds of test phases: those in which system configuration is continually modified to reduce the frequency of failures and those in which system configuration does not change. The system failure rate may be modeled as the intensity function of a Weibull process in the former case and a homogeneous Poisson process in the latter case. This paper considers a nonhomogeneous Poisson process consisting of a time truncated Weibull process followed by a time truncated homogeneous Poisson process and illustrates how such an extended model can be used to plan and evaluate a reliability demonstration test. The resulting methodology allows a unified treatment of failure data from two consecutive test phases and can reduce consumer and producer risks while at the same time requiring less test time. GRA

N82-21008# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.

WEIGHTED L-SQUARED QUANTILE DISTANCE ESTIMATORS FOR RANDOMLY CENSORED DATA

R. L. Eubank and V. N. LaRiccia Nov. 1981 21 p refs
(Contract N00014-75-C-0439)
(AD-A109544; TR-149) Avail: NTIS HC A02/MF A01 CSCL 12/1

The asymptotic properties of a family of minimum quantile function distance estimators for randomly censored data sets are considered. These procedures produce an estimator of the parameter vector that minimizes a weighted l squared distance measure between the Kaplan-Meier quantile function and an assumed parametric family of quantile functions. Regularity conditions are provided which insure that these estimators are consistent and asymptotically normal. An optimal weight function is derived for single parameter families, which, for location/scale families, results in censored sample analogs of estimators such as those suggested by Parzen (1979a, 1979b), and Weiss and Wolfowitz (1970). GRA

N82-21009# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.

UNIQUENESS AND EVENTUAL UNIQUENESS OF OPTIMAL DESIGNS IN SOME TIME SERIOUS MODELS, 2

R. L. Eubank Nov. 1981 16 p refs
(Contract N00014-75-C-0439)
(AD-A109545; TR-150) Avail: NTIS HC A02/MF A01 CSCL 12/1

Earlier results on the uniqueness and eventual uniqueness of optimal designs for certain time series models are extended to a wider class of processes which includes those with covariance structures such as that of multiple integrals of Brownian motion and Brownian bridge processes. The relationship between the problems of regression design for time series and piecewise polynomial approximation with free breakpoints is discussed and, consequently, asymptotic results obtained by Sacks and Ylvisaker (1970) are seen to hold under weaker assumptions for these processes. GRA

N82-21010# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.

ASYMPTOTICALLY OPTIMAL DESIGNS FOR SOME TIME SERIES MODELS

Randall L. Eubank, Patricia L. Smith, and Philip W. Smith Nov. 1981 21 p refs
(Contract N00014-75-C-0439)
(AD-A109546; TR-151) Avail: NTIS HC A02/MF A01 CSCL 12/1

The limiting behavior (as the sample size increases) of the BLUE of the regression coefficients is investigated in the case that derivative information is not available. Using the results of Barrow and Smith (1979) on the asymptotic properties of optimal quadrature formulas several results obtained by Eubank, Smith and Smith (1981) are extended to a multiparameter setting and a wider class of processes which includes multiple integrals of Brownian motion. The asymptotic behaviour of the variance of the BLUE is characterized in terms of the density defining the designs and densities which generate asymptotically optimal design sequences are provided for several optimality criteria.
Author (GRA)

N82-21011# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.

ON APPROXIMATE CONFIDENCE INTERVALS FOR MEASURES OF CONCORDANCE

Albert D. Palachek and William R. Schucany Nov. 1981 20 p refs
(Contract N00014-75-C-0439)
(AD-A109547; TR-152) Avail: NTIS HC A02/MF A01 CSCL 12/1

The use of U-statistics based on rank correlation coefficients in estimating the strength of concordance among a group of rankers is examined for cases where the null hypothesis of random rankings is not tenable. The studentized U-statistic is asymptotically distribution-free, and the Student-t approximation is used for small and moderate sized samples. An approximate confidence interval is constructed for the strength of concordance. Monte Carlo results indicate that the Student-t approximation can be improved by estimating the degrees of freedom.
Author (GRA)

N82-21012# Bowling Green State Univ., Ohio.

TESTING THE CORRELATION COEFFICIENT WITH INCOMPLETE OBSERVATIONS

James Beckett, William R. Schucany (Southern Methodist Univ.), and N. J. Bosmia (Southern Methodist Univ.) Nov. 1981 19 p refs
(Contract N00014-75-C-0439)
(AD-A109548; TR-153) Avail: NTIS HC A02/MF A01 CSCL 12/1

Correlation is often investigated (and tested for significance) in situations where some of the observations on one of the variables are missing. Throwing away these unpaired observations

may seem to be a waste of information; a test based on all the data at hand would seemingly be better than a test based on only some of the data available. An exact test using all the data, which is similar in form and distribution to the usual t test based on the sample correlation coefficient, is derived and examined. However, this exact test proves to be a relatively inefficient way to incorporate the extra information. This counterintuitive result provides an interesting lesson concerning the relationship between power and degrees of freedom.
Author (GRA)

N82-21013# Southern Methodist Univ., Dallas, Tex. Dept. of Statistics.
ON ARMA PROBABILITY DENSITY ESTIMATION
Jeffrey D. Hart and Henry L. Gray Dec. 1981 130 p refs
(Contract N00014-75-C-0439)
(AD-A109638; TR-156) Avail: NTIS HC A07/MF A01 CSCL 12/1

A new method of probability density estimation is investigated which exploits the Fourier series representation of a density function. The new method employs density estimators f(p,q)(.), p= 0,1,2,... and q = 0,1,2,..., which are such that f(O,q)(.) is a Fourier series (Kronmal-Tarter type) estimator and f(p,O)(.) is an autoregressive estimator. Each of the estimators f(p,q.)(.) (referred to as ARMA estimators) is shown to depend upon the e(n)-transform, thus providing a strong motivation for the use of estimators with both p > O and q > O. Small and large sample properties of ARMA density estimators are obtained and a data-based method of selecting optimal values of p and q is proposed. The results of a simulation study show that, for the densities considered, a savings in integrated square error is attained by using ARMA, rather than Fourier series, density estimation. GRA

N82-21014# Illinois Univ. at Chicago Circle, Chicago. Dept. of Mathematics.
ON SEGMENTATION OF TIME SERIES
Stanley L. Sclove 30 Nov. 1981 21 p refs Presented at the Special Session on Cluster Anal., 789th Meeting, Am. Math. Soc., Amherst, Mass., 16-18 Oct. 1981
(Contract N00014-80-C-0408; NR Proj. 042-443)
(AD-A109479; TR-81-1) Avail: NTIS HC A02/MF A01 CSCL 12/1

The problem of partitioning a time-series into segments is considered. The segments fall into classes, which may correspond to phases of a cycle (recession, recovery, expansion in the business cycle) or to portions of a signal obtained by scanning (background/clutter, target, background/clutter again, another target, etc.; or normal tissue, tumor, normal tissue). Parametric families of distributions are considered, a set of parameter values being associated with each class. With each observation is associated an unobservable label, indicating from which class the observation arose. The label process is modeled as a Markov chain. Segmentation algorithms are obtained by applying a method of iterated maximum likelihood to the resulting likelihood function. In this paper special attention is given to the situation in which the observations are conditionally independent, given the labels. A numerical example is given. Choice of the number of classes, using Akaike's automatic (model) identification criterion (AIC), is illustrated. Prediction is considered. Author (GRA)

N82-21015# Stanford Univ., Calif. Dept. of Operations Research.
THE SHIFT-FUNCTION APPROACH FOR MARKOV DECISION PROCESSES WITH UNBOUNDED RETURNS
Shaler Stidham, Jr. and Jo VanNunen Jul. 1981 57 p refs Prepared in cooperation with North Carolina State Univ., Raleigh
(Contract N00014-76-C-0418; Grants NSF ECS-80-17867; NSF ENG-78-24420; NR Proj. 047-061)
(AD-A109774; SU-TR-98; SU-TR-60) Avail: NTIS CSCL 12/1

We study a discrete-time Markov decision process with general state and action space. The objective is to maximize the expected total return over a finite or infinite horizon. The transition probability measure is allowed to be defective, so that the model includes discounting, state- and action-dependent transition times (semi-Markov decision processes), and stopping problems. With applications to control of queues and inventory systems as a motivation, we develop a set of conditions on the one-period return function, the transition probabilities and the terminal value function that guarantee uniform convergence (with respect to the sup norm) of the finite-horizon optimal value functions to the infinite-horizon optimal value function (successive approximations). These conditions are substantially weaker and more realistic for the applications we have in mind than those of the classical, discounted bounded model. Author (GRA)

N82-21016# Stanford Univ., Calif. Dept. of Statistics.
CHOOSING THE BEST OF THE CURRENT CROP
Stephen M. Samuels and Gregory Campbell 5 Oct. 1981 39 p refs
(Contract N00014-76-C-0475; NR Proj. 042-267)
(AD-A109659; SU-TR-308) Avail: NTIS HC A03/MF A01 CSCL 12/1

A best choice problem is presented which is intermediate between the constraints of the no-information problem (observe only the sequence of relative ranks) and the demands of the full information problem (observations from a known continuous distribution). In the intermidiate problem prior information is available in the form of a training sample of size-m and observations are the succesive ranks of the n-current items relative to their predecessors in both the current and training samples.
GRA

N82-21017# Stanford Univ., Calif. Dept. of Statistics.
ON THE ACCURACY OF SIMULATED PERCENTAGE POINTS
J. M. Juritz, J. W. F. Juritz, and M. A. Stephens 7 Oct. 1981 14 p refs
(Contract N00014-76-C-0475; NR Proj. 042-267)
(AD-A109660; SU-TR-309) Avail: NTIS HC A02/MF A01 CSCL 12/1

The estimates of percentage points of a distribution, obtained from one large sample of Monte Carlo values, are compared with those obtained by dividing the large sample into several subsamples and taking the average. The single-sample method appears to be preferable. Author (GRA)

N82-21018# Stanford Univ., Calif. Dept. of Statistics.
OPTIMAL SEQUENTIAL SELECTION OF A MONOTONE SEQUENCE FROM A RANDOM SAMPLE
Stephen M. Samuels and J. Michael Steele 10 Nov. 1981 31 p refs
(Contract N00014-76-C-0475; NR Proj. 042-267)
(AD-A109661; SU-TR-310) Avail: NTIS HC A03/MF A01 CSCL 12/1

The length of the longest monotone increasing subsequence of a random sample of size n is known to have expected value asymptotic to (2n)(to the 1/2 power). We prove that it is possible to make sequential choices which give an increasing subsequence of expected length asymptotic to (2n)(to the 1/2 power). Moreover, this rate of increase is proved to be asymptotically best possible. Author (GRA)

N82-21019# Stanford Univ., Calif. Dept. of Statistics.
ON TESTS FOR UNIFORMITY: NEYMAN'S STATISTIC AND STATISTICS BASED ON GAPS AND STRETCHES
Herbert Solomon and Michael A. Stephens 16 Nov. 1981 14 p refs
(Contract N00014-76-C-0475; NR Proj. 042-267)
(AD-A109662; SU-TR-311) Avail: NTIS HC A02/MF A01 CSCL 12/1

Distributions of two statistics arising in sampling from a uniform distribution are investigated. They are Neyman's smooth goodness-of-fit statistic of order two and the maximum of a gap or stretch between p points in a sample of size n, p less than or equal to n. Pearson curve fits are applied to each situation thereby extending percentile tables provided by F.N. David (1939) for Neyman's statistic of order two, and indicating usage in computing percentiles for the stretch statistic. The Pearson curve values are excellent approximations along the range of values of each statistic. Author (GRA)

N82-21020 Michigan Univ., Ann Arbor.
STOCHASTIC INTEGRATION IN BANACH SPACES AND

APPLICATIONS Ph.D. Thesis
Nadav Berman 1981 204 p
Avail: Univ. Microfilms Order No. 8125068

A theory of stochastic integration in Banach spaces and applications in the area of stochastic differential equations in Banach spaces are considered. The concept of cylindrical stochastic process in Banach space is defined, then the notion of a cylindrical Wiener process in real separable Banach space, B, and based on a probability space is introduced. A stochastic integral in B sub 1 called the weak stochastic integral is defined with an integrator for a class of stochastic integrands. Various theorems concerning properties of the weak stochastic integral are proved. Conditions under which the stochastic integral becomes a B sub 1 valued stochastic process are given. The theory of stochastic integration in Banach spaces is then applied to stochastic differential equations in Banach spaces. A linear sochastic differential equation in a real separable reflextive Banach B sub 1 is considered. Dissert. Abstr.

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N82-21021 Georgia Inst. of Tech., Atlanta.
A GEOMETRICAL APPROACH TO LINEAR SYSTEMS BASED ON THE RICCATI EQUATION Ph.D. Thesis
Frank Leroy Lewis 1981 120 p
Avail: Univ. Microfilms Order No. 8125528

The state variable formulation of discrete time linear systems is used to develop a link between the geometric viewpoint of Wonham and Morse and the theory of the Riccati equation. A comprehensive framework on the one hand provides a theory which subsumes many previously known results and generates several new ones, and on the other hand provides a convenient computational approach which is based upon solving the Riccati equation. This framework depends on three main novel ideas. First, a nonrecursive solution to the singular Riccati equation is derived, and applications to the special cases of output control and stabilizability are outlined. Second, various subspace recursions are associated with different forms of Riccati equation, and it is shown how subspaces important in system theory, such as the supremal (F,G)-invariant and reachability subspaces, can therefore be computed by solving Riccati equations. Third, four generalized output nulling subspaces are defined and by using the expanded state equation it is shown how they can be computed from Riccati equations. It is then shown how particular subspaces related to observability, reconstructibility, controllability, reachability, and left and right inversion can be expressed as special cases of the four generalized output nulling subspaces.
Dissert. Abstr.

N82-21022 Yale Univ., New Haven, Conn.
PROBLEMS IN NONLINEAR SYSTEM REALIZATION THEORY Ph.D. Thesis
Michael Essex Evans 1981 107 p
Avail: Univ. Microfilms Order No. 8125662

The problem of constructing minimal realizations of linear analytic systems whose input-output maps admit a Volterra representation which is finite is examined. In particular, a constructive algorithm which reduces a minimal internally bilinear realization of a k power to a minimal linear analytic realization is presented. A special form for the dynamics of a minimal internally bilinear realization is derived, and the reduction technique proceeds via the use of the truncated Carleman linearization technique, linear algebra, and the properties of homogeneous functions. The form of the minimal realization shows that it consists of a cascade of a finite number of finite dimensional linear systems coupled by polynomial (feedforward) link maps.
Dissert. Abstr.

N82-21023# Naval Postgraduate School, Monterey, Calif.
A METHODOLOGY TO FIND OVERALL SYSTEM EFFECTIVENESS IN A MULTICRITERION ENVIRONMENT USING SURFACE TO AIR MISSILE WEAPON SYSTEMS AS AN EXAMPLE M.S. Thesis
Knut O. Flaathen Sep. 1981 138 p refs
(AD-A109549) Avail: NTIS HC A07/MF A01 CSCL 16/4

Overall system effectiveness from a multicriterion environment using SAM weapon systems as an example was studied. SAM weapon systems were rated by four groups of experienced individuals, and judged overall system effectiveness for each system was calculated using the Constant Sun Scaling Method. Multiple regression analysis was then used to establish a functional relationship between overall system effectiveness and weapon characteristics (including missile price). It was concluded that there were no significant differences among the judged results in the four groups, nor between judged and functional overall system effectiveness. GRA

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N82-21024# National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
CONNECTEDNESS OF LEVEL SETS AS A GENERALIZATION OF CONCAVITY
D. H. Martin Mar. 1981 18 p refs
(CSIR-TWISK-200) Avail: NTIS HC A02/MF A01

The property of the connectedness of upper level sets is shown to have some claim to be regarded as a viable generalization of concavity in optimization theory. Recent work on the natural occurrence of connected (but non-convex) level sets in parametric linear programming, and on the relationship between the connectedness of level sets and uniqueness is surveyed. A result on the preservation of the connectedness of level sets under a very general form of supremal convolution is presented. This result has direct application to multistage decision processes.
J.D.H.

N82-21025# Stanford Univ., Calif. Dept. of Statistics.
ON THE CYCLIC BEHAVIOR OF RANDOM TRANSFORMATIONS ON A FINITE SET
Alan E. Gelfand 4 Aug. 1981 31 p refs
(Contract N00014-76-C-0475; NR Proj. 042-267)
(AD-A109694; SU-TR-305) Avail: NTIS HC A03/MF A01 CSCL 12/1

Let X be a finite set of elements and let tau be the set of all transformations from X into itself. For T epsilon tau we take T superscript k to have its usual meaning. Starting from a given x epsilon X consider the sequence T superscript j x, j = 0,1,2... Since X is finite the sequence T superscript j must eventually encounter an element it had shown before. Thereafter it must repeat this intermediate sequence of elements. Such a sequence is called a cycle and the number of distinct elements in the cycle is called the cycle length. For a given T, not all x's must be on a cycle and, moreover, starting from differing x's may lead T into differing cycles. Hence we have the notion of a cycle space for T. It is the purpose of this paper to discuss a collection of exact and asymptotic results describing the cycle space of a randomly selected T. In particular, we examine such variables as the number of elements on a cycle of a specified length, the number of elements on cycles, the number of cycles and the length of a cycle. GRA

N82-21026 Oklahoma Univ., Norman.
JORDO-KALUZA-KLEIN TYPE UNIFIED THEORIES OF GAUGE AND GRAVITY FIELDS Ph.D. Thesis
Terry Dean Bradfield 1981 68 p
Avail: Univ. Microfilms Order No. 8129408

Generalizations of Jordan-Kaluza-Klein unified field theories based on a principle fiber bundle erected over spacetime was studied. These theories follow the standard general relativistic procedure in that gravitation is described by a (metric compatible) affine connection on spacetime. Gauge fields are assumed to arise from the more general notion of a connection on the bundle. The two types of fields are combined by means of the affine connection on the total bundle space. Spacetime tensor fields and fields in the Lie algebra of the structure group of the bundle may also be regarded as fields within the tangent space of the bundle. It was required that covariant derivatives calculated

from the connection on the total bundle space agree with those calculated from the gravity connection on spacetime and the gauge connection on the bundle. This requirement eliminates the components of the total bundle space metric corresponding to the group dimensions as degrees of freedom in the theory. For arbitrary gauge fields, this part of the metric is in fact required to be invariant under the action of the group and its components must be spacetime constants. Potentially troublesome scalar-tensor versions of this theory are also ruled out by this requirement. Dissert. Abstr.

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N82-21027# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
RESEARCH IN MULTI-COLOR THIN FILM EMITTERS Final Report, 15 Mar. 1979 - 30 Sep. 1981
L. G. Hale Dec. 1981 40 p refs
(Contract N00014-79-C-0341)
(AD-A109817; ERC41026.2FR) Avail: NTIS HC A03/MF A01 CSCL 20/3

A green thin film electroluminescent emitter was developed capable of greater than 700 fL brightness. This is the brightest green EL device reported to date. In addition, both a blue and a red thin film emitter were fabricated. The red emitter produced 15 fL and the blue 1 fL. The device is a multilayer structure consisting of a rare earth activated ZnS layer sandwiched between two dielectric layers of Y2O3. GRA

N82-21132*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROSPECTS FOR GAMMA RAY ASTRONOMY
In its Gamma Ray Astrophys. 1981 p 385-389 refs (For primary document see N82-21118 11-90)
Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N82-21028 Pennsylvania State Univ., University Park.
ACOUSTIC RADIATION AND DIFFRACTION EFFECTS FROM CONVEX AND CONCAVE DOMES Ph.D. Thesis
Hideo Suzuki 1981 161 p
Avail: Univ. Microfilms Order No. 8129227

The effects of the diaphragm shape of a loudspeaker on the radiation and diffraction characteristics are discussed using convex and concave domes in an infinite baffle. The least square error method, one of the weighted residual methods, is employed as the mathematical tool for the solution of the problems. The results show that these characteristics are highly dependent on the shape of the diaphragm, even if it vibrates like a piston. The response of the concave dome has a wide peak due to the cavity resonance, resulting in higher radiation efficiency. The convex dome has lower on-axis pressure response in the same region due to the dispersion of energy to the off-axis direction. The diffraction of sound from a concentric ring source by the convex and concave domes is also investigated in order to discuss the interaction between the loudspeaker units of a complete system. Dissert. Abstr.

N82-21029 Pennsylvania State Univ., University Park.
NOISE GENERATION BY GAS JETS IN A TURBULENT WAKE Ph.D. Thesis
John Joseph Gavigan 1981 120 p
Avail: Univ. Microfilms Order No. 8129162

No experimental studies of gas jet-turbulence interaction noise under controlled conditions can be found in the literature. Measurements of this phenomenon were made in the 1.22 cm diameter test section of the Garfield Thomas Water Tunnel. Gas was exhausted from the aft end of the strut-mounted test body into the turbulent wake. A directional hydrophone mounted outside the flow in a water-filled tank on one side of the test section was used to make one-third-octave-band acoustic measurements in the frequency range 5 - 50 kHz. By varying the gas exhaust orifice diameters, gas flow rates, and water peeds, the interdependence of the important parameters to radiated noise was determined. For a range of variables used in these experiments, the radiated noise is primarily a function of the ratio of orifice diameter to turbulence length scale, and only secondarily, a function of gas flow rates. Analyses of the results indicate that noise generated by the formation, division, coalescence, and collapse of bubbles can be related to the critical Weber number of the flows. Dissert. Abstr.

N82-21030*# Bionetics Corp., Hampton, Va.
SOUND MEASUREMENTS AND OBSERVATIONS OF THE MOD-0A WIND TURBINE GENERATOR
Kevin P. Shepherd and Harvey H. Hubbard (College of William and Mary, Newport News, Va.) Feb. 1982 20 p refs
(Contract NAS1-14970; Grant NAG1-166)
(NASA-CR-165856; NAS 1.26:165856) Avail: NTIS HC A02/MF A01 CSCL 20A

Sound measurements are reported for a wind velocity of about 5 m/s and a power output of about 70 kW. Both broadband and narrowband data were obtained for a range of distances and azimuth angles from the machine. Both discrete frequency and broadband components were identified. Loading harmonics at multiples of the blade passage frequency and electrical generator harmonics at multiples of the shaft speed dominated the spectrum below 100 Hz. The 10,000 Hz peak is believed to be of mechanical origin in the nacelle and the other arises from blade aerodynamic sources. Aural detection distances of about 525 m upwind and 850 downwind were observed. T.M.

N82-21031*# Avco Lycoming Div., Stratford, Conn.
YF 102 IN-DUCT COMBUSTOR NOISE MEASUREMENTS WITH A TURBINE NOZZLE, VOLUME 1 Final Report, Sep. 1979 - Mar. 1981
Craig A. Wilson and James M. OConnell Sep. 1981 63 p refs
(Contract NAS3-21974)
(NASA-CR-165562-Vol-1; NAS 1.26:165562-Vol-1; LYC-81-32-Vol-1) Avail: NTIS HC A04/MF A01 CSCL 20A

The internal noise generated by an Avco Lycoming YF-102 engine combustor installed in a test rig was recorded. Two configurations were tested one with and one without the first stage turbine nozzle installed. Acoustic probes and accessories were used. Internal dynamic pressure level measurements were made at ten locations within the combustor. The combustor rig, the test procedures, and data acquisition and reduction systems are described. Tables and plots of narrow band and one third octave band pressure level spectra are included. S.L.

N82-21032*# Avco Lycoming Div., Stratford, Conn.
YF 102 IN-DUCT COMBUSTOR NOISE MEASUREMENTS WITH A TURBINE NOZZLE, VOLUME 2 Final Report
Craig A. Wilson and James M. OConnell Sep. 1981 232 p refs
(Contract NAS3-21974)
(NASA-CR-165562-Vol-2; NAS 1.26:165562-Vol-2; LYC-81-32-Vol-2) Avail: NTIS HC A11/MF A01 CSCL 20A

The internal noise generated by an Avco Lycoming YF-102 engine combustor installed in a test rig was recorded. The one third octave band pressure level spectra is presented. S.L.

N82-21033*# Avco Lycoming Div., Stratford, Conn.
YF 102 IN-DUCT COMBUSTOR NOISE MEASUREMENTS WITH A TURBINE NOZZLE, VOLUME 3 Final Report
Craig A. Wilson and James M. OConnell Sep. 1981 244 p refs
(Contract NAS3-21974)
(NASA-CR-165562-Vol-3; NAS 1.26:165562-Vol-3; LYC-81-32-Vol-3) Avail: NTIS HC A11/MF A01 CSCL 20A

The internal noise generated by an Avco Lycoming YF-102

engine combustor installed in a test rig was recorded. The narrow band pressure level spectra is presented. S.L.

N82-21034*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PRELIMINARY SONIC BOOM CORRELATION OF PREDICTED AND MEASURED LEVELS FOR STS-1 ENTRY
Frank Garcia, Jr., Karen M. Morrison, Jess H. Jones (NASA, Marshall Space Flight Center), and Herbert R. Henderson (NASA, Langley Res. Center) Feb. 1982 38 p refs
(NASA-TM-58242; S-511; NAS 1.15:58242) Avail: NTIS HC A03/MF A01 CSCL 20A

A preliminary analysis correlating peaks from sonic boom pressure signatures recorded during the descent trajectory of the Orbiter Columbia, which landed in the dry lake bed at Edwards Air Force Base (EAFB), California, with measured wind tunnel signatures extrapolated from flight altitudes to the ground has been made for Mach numbers ranging from 1.3 to 6. The flight pressure signatures were recorded by microphones positioned at ground level near the groundtrack, whereas the wind tunnel signatures were measured during a test of a 0.0041-scale model Orbiter. The agreement between overpressure estimates based on wind tunnel data using preliminary flight trajectory data and oscillograph traces from ground measurements appears reasonable at this time for the range of Mach numbers considered. More detailed studies using final flight trajectory data and digitized ground measured data will be performed. Author

N82-21035*# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
APPLICATIONS OF ACOUSTICS IN THE MEASUREMENT OF COAL SLAB THICKNESS Final Report
W. J. Hadden, Jr., J. M. Mills, and A. D. Pierce 29 Feb. 1980 92 p refs
(Contract NAS8-33093)
(NASA-CR-161445; NAS 1.26:161445) Avail: NTIS HC A05/MF A01 CSCL 20A

The determination of the possibility of employing acoustic waves at ultrasonic frequencies for measurements of thicknesses of slabs of coal backed by shale is investigated. Fundamental information concerning the acoustical properties of coal, and the relationship between these properties and the structural and compositional parameters used to characterize coal samples was also sought. The testing device, which utilizes two matched transducers, is described. R.J.F.

N82-21036*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FORWARD ACOUSTIC PERFORMANCE OF A MODEL TURBOFAN DESIGNED FOR A HIGH SPECIFIC FLOW (QF-14)
James G. Lucas, Richard P. Woodward, and Charles J. Michels Mar. 1982 20 p refs
(NASA-TP-1968; E-777; NAS 1.60:1968) Avail: NTIS HC A02/MF A01 CSCL 20A

Forward noise and overall aerodynamic performance are presented for a high-tip-speed fan having an exceptionally high average axial Mach number at the rotor inlet. This high Mach number is intended to attenuate forward noise at both the design-speed takeoff point, and at the unconventional low-pressure-ratio, design-speed approach point. As speed was increased near design, all forward noise components were reduced, and rear noise in the discharge duct was increased, indicating that the high Mach number flow at the rotor face is attenuating forward noise at takeoff. The fan at takeoff is some 5.5 to 11 dB quieter than several reference fans. Data at the point closest to approach indicated tentatively that the design-speed approach mode was 3 dB quieter than the conventional mode. M.G.

N82-21037*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
FLUCTUATING PRESSURES ON FAN BLADES OF A TURBOFAN ENGINE: STATIC AND WIND-TUNNEL INVESTIGATIONS
James A. Schoenster Mar. 1982 48 p refs
(NASA-TP-1976; L-14913; NAS 1.60:1976) Avail: NTIS HC A03/MF A01 CSCL 21E

To investigate the fan noise generated from turbofan engines, miniature pressure transducers were used to measure the fluctuating pressure on the fan blades of a JT15D engine. Tests were conducted with the engine operating on an outdoor test stand and in a wind tunnel. It was found that a potential flow interaction between the fan blades and six, large support struts in the bypass duct is a dominant noise source in the JT15D engine. Effects of varying fan speed and the forward speed on the blade pressure are also presented. Author

N82-21038# Canada Inst. for Scientific and Technical Information, Ottawa (Ontario). Div. of Building Research.
TEMPORAL AND SPATIAL DISPERSION OF SOUND LEVELS IN A REVERBERANT SPACE
J. P. Guilhot, C. Legros, and J. P. Flenner (Paul Sabtier Univ., Toulouse, France) Jan. 1982 21 p refs Transl. into ENGLISH from Acustica 48: (4) (Canada), 1981 p 232-238
(ISSN-0077-5606; Transl-243; NRS/CNR-TI-2015) Avail: NTIS HC A02/MF A01

Acoustical measurements in rooms are generally made with the aid of a random excitation signal, white noise or pink noise. The sound level measured at a point, fluctuates depending on the duration of the integration and of the bandwidth of the noise. If the measurement point is chosen in a random fashion in the room, the sound field can be simulated by a multidimensional random process which depends on time and on space. The mean square value of the acoustic pressure in time and in space is estimated. Spatial mean is estimated by sampling, by the choice of positions of source and of the point of measurement, and the mean over time by an integration of a finite duration. The spatial and temporal variances of the level of the acoustical pressure measured in a reverberant space are determined. S.L.

N82-21039# Naval Underwater Systems Center, New London, Conn. Surface Ship Sonar Dept.
A FURTHER STUDY OF THE SPACE AND TIME STABILITY OF A NARROWBAND ACOUSTIC SIGNAL IN THE OCEAN: SHORT RANGE RESULTS
P. D. Koenigs, P. D. Herstein, and D. G. Browning 21 Dec. 1981 15 p Presented at the 102nd Meeting of the Acoustic Soc. of Am., Miami Beach, Fla., 1 Dec. 1981
(ARPA Order 2976)
(AD-A109668; NUSC-TD-6605) Avail: NTIS HC A02/MF A01 CSCL 20/1

The oral and visual presentation entitled 'A Further Study of the Space and Time Stability of a Narrowband Acoustic Signal in the Ocean: Short Range Results,' is discussed. In the series on the space and time stability of a narrowband acoustic signal, results from short (16-17 nmi) ranges are presented. In contrast to the data obtained at longer ranges an increased frequency spread was found in the received signal due to the greater number of possible raypaths at short ranges. A marked change in the character of the received signal was observed at ranges less than 70 nmi. Space and time variability are given to percentage Doppler shift and bandwidth. Comparison is made to data previously reported and with predictions of the Multi-path Expansion Option of the Generic Sonar Model. GRA

N82-21040# Ocean Data Systems, Inc., Rockville, Md.
RSVP UPGRADE AND MAINTENANCE Final Task Report
Jacqueline Webster 18 Dec. 1981 114 p
(Contract N00014-78-C-0818; ODSI Proj. 1100)
(AD-A109855) Avail: NTIS HC A06/MF A01 CSCL 20/1

The RSVP system retrieves sound profiles from a modified and reformatted NODC ocean station data base, and determines representative profiles from among those that are retrieved. The representatives are then used as input to acoustic modelling programs and for other oceanographic analysis. Under Contract No. N00014-78-C-0818, modifications were made to two of the programs in the system, RSVP and RSVPPLP. Author (GRA)

N82-21041# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
ACOUSTIC MEASUREMENTS OF F-4E AIRCRAFT OPERATING IN HUSH HOUSE, NSN 4920-02-070-2721 Final Report, May - Sep. 1981
Vincent R. Miller, G. A. Plzak, and J. M. Chinn Sep. 1981 105 p refs

(AD-A109827; AFWAL-TM-81-84-FIBE/FIBG) Avail: NTIS HC A06/MF A01 CSCL 20/1

The primary purpose of this test program was to measure the acoustic environment in the hush house facility located at Kelly Air Force Base, Texas, during operation of the F-4E aircraft to ensure that aircraft structural acoustic design limits were not exceeded. The acoustic measurements showed that sonic fatigue problems are anticipated with the F-4E aircraft aft fuselage structure during operation in the hush house. The measured acoustic levels were less than those measured in an F-4E aircraft water cooled hush house at Hill AFB in the lower frequencies, but were increased over that measured during ground run up on some areas of the aircraft. It was recommended that the acoustic loads measured in this program should be specified in the structural design criteria for aircraft which will be subjected to hush house operation or defining requirements for associated equipment. Recommendations were also made to increase the fatigue life of the aft fuselage. Author (GRA)

N82-21042# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

ACOUSTIC MEASUREMENTS OF F-15 AIRCRAFT OPERATING IN HUSH HOUSE, NSN 4920-02-070-2721 Final Report, May - Sep. 1981

Vincent R. Miller, G. A. Plzak, and J. M. Chinn Sep. 1981 117 p refs

(AD-A109828; AFWAL-TM-81-82-FIBE/FIBG) Avail: NTIS HC A06/MF A01 CSCL 20/1

The purpose of this test program was to measure the acoustic environment in the hush house facility located at Kelly Air Force Base, Texas, during operation of the F-15 aircraft to ensure that aircraft structural acoustic design limits were not exceeded. The acoustic measurements showed that no potential sonic fatigue problems are anticipated with the F-15 aircraft structure during operation in the hush house. However, since these acoustic levels were increased over those measuring during run up on a concrete pad, it is recommended that F-15 equipment qualification levels be checked. The data indicated that the noise field within the hush house is diffuse and that the acoustical energy in the hangar area is radiated from the region between the engine exhaust and the hush house muffler front edge toward the forward part of the hangar. Author (GRA)

N82-21043# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.

ACOUSTIC MEASUREMENTS OF F-16 AIRCRAFT OPERATING IN HUSH HOUSE, NSN 4920-02-070-2721 Final Report, May - Sep. 1981

Vincent R. Miller, G. A. Plzak, and J. M. Chinn Sep. 1981 110 p refs

(AD-A109829; AFWAL-TM-81-83-FIBE/FIBG) Avail: NTIS HC A06/MF A01 CSCL 20/1

The purpose of this test program was to measure the acoustic environment in the hush house facility located at Kelly Air Force Base, Texas, during operation of the F-16 aircraft to ensure that aircraft structural acoustic design limits were not exceeded. The acoustic measurements showed that no sonic fatigue problems are anticipated with the F-16 aircraft aft fuselage structure during operation in the hush house. The measured acoustic levels were less than those measured in an F-16 aircraft water cooled hush house at Hill AFB, but were increased over that measured during ground run up. It was recommended that the acoustic loads measured in this program should be specified in the structural design criteria for aircraft which will be subjected to hush house operation or defining requirements for associated equipment. Author (GRA)

N82-21044# Texas Instruments, Inc., Lewisville. Equipment Group.

ADA INTEGRATED ENVIRONMENT 3 Interim Report, 15 Sep. 1980 - 15 Mar. 1981

Griffiss AFB, N.Y. RADC Dec. 1981 78 p

(Contract F30602-80-C-0293; AF Proj. 5581)

(AD-A109748; RADC-TR-81-361) Avail: NTIS HC A05/MF A01 CSCL 09/2

The ADA Integrated Environment (AIE) consists of a set of software tools intended to support design, development and maintenance of embedded computer software. A significant portion of an AIE includes software systems and tools residing and executing on a host computer (or set of computers). This set is known as an ADA Programming Support Environment (APSE). The rationale of the design for a minimal APSE, called a MAPSE is described. The MAPSE is the foundation upon which an APSE is built and will provide comprehensive support throughout the design, development and maintenance of Ada software. The MAPSE tools described include an Ada compiler, linker/loader, debugger, editor, and configuration management tools. The kernel (KAPSE) provides the interfaces (user, host, tool), database support, and facilities for executing ADA programs (runtime support system). Program segmentation, command language design goals, database design goals, and compiler design goals are discussed. GRA

N82-20343# Southampton Univ. (England). Inst. of Sound and Vibration Research.

VIBRATION OF STRUCTURES EXCITED ACOUSTICALLY

B. L. Clarkson *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 19-37 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

N82-20344# Cambridge Acoustical Associates, Inc., Mass.

FUNDAMENTAL CONCEPTS OF SOUND RADIATION

M. C. Junger *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 38-42 ref (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

N82-20345# Naval Ship Research and Development Center, Bethesda, Md.

FUNDAMENTAL CONCEPTS OF FLOW-GENERATED NOISE

William K. Blake *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 43-53 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

N82-20346# Cambridge Acoustical Associates, Inc., Mass.

EXTENDED SOUND SOURCES

M. C. Junger *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 54-59 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

N82-20347# Naval Ship Research and Development Center, Bethesda, Md.

STOCHASTIC EXCITATION OF ELASTIC STRUCTURES AND EXAMPLES OF FLOW-GENERATED NOISE

William K. Blake *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 60-71 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

N82-20348# Cambridge Acoustical Associates, Inc., Mass.

SOUND RADIATION BY ELASTIC STRUCTURES

M. C. Junger *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 72-75 ref (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

N82-20355# Cambridge Acoustical Associates, Inc., Mass.

PROCEDURES RELATING THE NEAR- TO THE FAR-FIELD: IMAGING TECHNIQUES

M. C. Junger *In* AGARD Mod. Data Anal. Tech. in Noise and Vibration Probl. Nov. 1981 p 142-149 refs (For primary document see N82-20340 11-31)

Avail: NTIS HC A08/MF A01

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N82-21045 Illinois Univ. at Urbana-Champaign.

ELECTRON IONIZATION AND EXCITATION COEFFICIENTS

FOR ARGON, KRYPTON, AND XENON IN THE LOW E/p REGION AND KINETICS OF INTERHALOGEN DIATOMICS
Ph.D. Thesis
Lindley Thomas Specht 1981 142 p
Avail: Univ. Microfilms Order No. 8127699

The electron ionization and excitation coefficients for Ar, Kr, and Xe were measured in the low E/p region (1-12 V/cm torr) using a drift tube apparatus. Discrepancies between previous measurements were resolved and are due to photoelectric emission attributed to the rare gas metastables. A revised set of self consistent near threshold inelastic cross sections for each rare gas studied was determined. Experiments aimed at trying to measure the electron excitation cross sections from the metastable states of the rare gases are also described. The spectra of the E yields A3II states of IF and IC1 was obtained and for the former showed clearly resolvable rotational structure. The lifetimes of the E states of IF and IC1 were also estimated from pulsed discharge experiments. The vibrational self quenching rate of the IC1 A3II state was estimated and also the argon quenching rate of this same state was measured. Dissert. Abstr.

N82-21046# Washington Univ., Seattle. Dept. of Chemistry.
SINGLE COLLISION GAS-SURFACE VIBRATIONAL ENERGY TRANSFER IN REACTIVE SYSTEMS. VARIATION OF INITIAL ENERGY DISTRIBUTION
R. Arakawa, D. F. Kelley, and B. S. Rabinovitch 25 Nov. 1981 25 p refs Submitted for publication
(Contract N00014-75-C-0690; NR Proj. 092-549)
(AD-A108931) Avail: NTIS HC A02/MF A01 CSCL 07/3

The initial vibrational energy distribution of molecules that collide with a hot surface was varied. The effect on the collisional reaction probability was studied under single collision conditions. These experiments provide a more sensitive test of the relative suitability of various analytical forms for the collisional transition probability matrix, (CTPM). The reaction system is the isomerization of cyclobutene to 1,3 butadiene. A seasoned fused quartz surface was used over the temperature range 600 K - 900 K. Variation of the initial vibrational energy population vector of cyclobutene molecules was made by a change of their initial temperaure in the range 273 K - 620 K. Gaussian or Boltzmann exponential forms of (CTPM) prove to be the most suitable to fit the data. GRA

N82-21047# Harvard Univ., Cambridge, Mass. Div. of Applied Sciences.
CREEP, DIFFUSION, AND STRUCTURAL RELAXATION IN METALLIC GLASSES
A. L. Greer and F. Spaepen Jan. 1982 26 p
(Contract N00014-77-C-0002; NR Proj. 039-136)
(AD-A109891; TR-13) Avail: NTIS HC A03/MF A01 CSCL 11/2

The experimental evidence on atomic transport (creep, diffusion, structural relaxation) in metallic glasses is reviewed, together with the microscopic mechanisms. The similarity between homogeneous viscous flow and diffusion is apparent, and both processes are quite distinct from the relaxation process. The linear kinetics of the latter are explained by a biomolecular mechanism. The linear kinetics of the latter are explained by a bimolecular mechanism. Changes in the curie temperature during structural relaxation are related to the changes in viscosity, via the free volume model and the average coordination number of the atoms. GRA

N82-21048# Australian National Univ., Canberra. Dept. of Nuclear Physics.
STUDY OF THE SECOND-ORDER PROCESSES IN THE ELASTIC SCATTERING OF POLARIZED DEUTERONS
J. Nurzynski, W. Gruebler (Eidg. Technische Hochschule, Zurich), H. R. Burgi (Eidg. Technische Hochschule, Zurich), V. Konig (Eidg. Technische Hochschule, Zurich), R. Risler (Eidg. Technische Hochschule, Zurich), and B. Jenny (Eidg. Technische Hochschule, Zurich) Jan. 1981 28 p refs
(ANU-P-767) Avail: NTIS (US Sales Only)HC A03/MF A01; DOE Depository Libraries

Angular distributions for the differential cross sections and the vector analyzing powers for (76) (78) (80) (82)Se (d(pol), d) scattering at 12 MeV incident deuteron energy, were analyzed by a coupled channel Born approximation. Two step scattering processes involving inelastic excitations and single neutron transfer reactions, are included. The relative strengths and the parameter dependence is determined. It is found that excitation of 21 states dominates over all other second order processes and that it has a strong influence upon the elastic scattering. DOE

N82-21049# Argonne National Lab., Ill.
LEE, THE LOW-ENERGY ELECTRON-BOMBARDMENT MACHINE FOR VERY HIGH DOSE IONIZATION STUDIES
W. L. Primak Aug. 1981 35 p refs
(Contract W-31-109-eng-38)
(DE82-003232; ANL-81-56) Avail: NTIS HC A03/MF A01

The construction and operation of a low energy electron bombardment machine designed to study the effects of extremely high doses and dose rates of ionization on materials is described. Radiation damage in radioactive wastes and the radiation effects experienced at the wall at a Tokamak fusion reaction are considered. The electron source provides doses of radiation for laboratory purposes. Direct bombardment by electron is obtained in a well defined range and the dose is determined easily. The requirements are the mounting of a small electron gun in a suitable vacuum system and to provide a secondary power supply with voltages comparable to those utilized in TV sets, which can be built in an ordinary laboratory. DOE

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N82-21050*# Morgan (David L., Jr.), Livermore, Calif.
CONCEPTS FOR THE DESIGN OF AN ANTIMATTER ANNIHILATION ROCKET
David L. Morgan, Jr. [1982] 33 p refs Prepared for JPL
(NASA Order LH-739408)
(NASA-CR-168660; NAS 1.26:168660) Avail: NTIS HC A03/MF A01 CSCL 21F

Matter-antimatter annihilation is considered for spacecraft propulsion. Annihilation produces considerably more energy per unit mass of propellant than any other known means of energy production. An antimatter annihilation rocket requires several systems and components that are unique to its nature. Among these are an antimatter storage system, a means to extract the antimatter from storage, a system to transport the antimatter to the rocket engine, and the engine wherein annihilation occurs and thrust is produced. Design concepts of these systems and components are presented and discussed. S.L.

N82-21051# Colorado Univ., Boulder. Dept. of Physics.
ELEMENTARY PARTICLES AND HIGH-ENERGY PHYSICS Progress Report, Jan. - Dec. 1981
Uriel Nauenberg Nov. 1981 22 p refs
(Contract DE-AC02-81ER-40025)
(DE82-003654; DOE/ER-40025/1) Avail: NTIS HC A02/MF A01

The tagged photon spectrometer data collection, the MAC detector preliminary results and performance testing, and theoretical studies during the year are considered. These include supercooling in SU(5) to look into why there is a lack of magnetic monopoles in the universe, a study of mass generation of neutrinos in grand unified theories, a study to determine whether dynamical symmetry breaking for SU(2) x U(1) gauge theory of electroweak interactions is possible without the existence of fundamental Higgs scalars, and studies to determine the behavior of nonAbelian magnetic fields at high temperature. DOE

74 OPTICS

Includes light phenomena.

N82-21052 British Library Lending Div., Boston Spa (England).
INCOHERENT SCATTERING OF LIGHT BY A FINITE VOLUME OF RELATIVISTIC PLASMA
A. B. Kukushkin 3 Sep. 1981 17 p refs Transl. into ENGLISH from Fiz. Plazmy (USSR), v. 7, no. 1, 1981 p 110-118
(BLL-CTO-1945-(9091.9F)) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Incoherent scattering of laser radiation by a finite volume of relativistic plasma is considered. The effect caused by the finite time for which an electron remains in the scattering volume (the finite transit time effect) is studied, and the true conditions under which the effect is important is indicated. The relationship between the classical and quantum cross sections for the incoherent scattering of light by electrons in the limiting case when the finite transit time effect is entirely absent is discussed. S.L.

N82-21053*# ITT Aerospace/Optical Div., Fort Wayne, Ind.
STEREO ELECTRO-OPTICAL TRACKER STUDY FOR THE MEASUREMENT OF MODEL DEFORMATIONS AT THE NATIONAL TRANSONIC FACILITY Final Report
Richard J. Hertel and Kent A. Hoilman Jan. 1982 110 p refs
(Contract NAS1-16580)
(NASA-CR-165821; NAS 1.26:165821) Avail: NTIS HC A06/MF A01 CSCL 20F

The effects of model vibration, camera and window nonlinearities, and aerodynamic disturbances in the optical path on the measurement of target position is examined. Window distortion, temperature and pressure changes, laminar and turbulent boundary layers, shock waves, target intensity and, target vibration are also studied. A general computer program was developed to trace optical rays through these disturbances. The use of a charge injection device camera as an alternative to the image dissector camera was examined. S.L.

N82-21054*# Cornell Univ., Ithaca, N. Y. Dept. of Astronomy.
THE SIXTEEN TO FORTY MICRON SPECTROSCOPY FROM THE NASA LEAR JET Final Technical Report, 1 Oct. 1970 - 31 Oct. 1980
J. R. Houck Mar. 1982 63 p refs
(Grant NGR-33-010-182)
(NASA-CR-168684; NAS 1.26:168684) Avail: NTIS HC A04/MF A01 CSCL 20F

Two cryogenically cooled infrared grating spectrometers were designed, fabricated and used on the NASA Lear Jet Observatory. The first spectrometer was used to measure continuum sources such as dust in H II regions, the galactic center and the thermal emission from Mars, Jupiter, Saturn, and Venus over the 16 to 40 micron spectral range. The second spectrometer had higher resolution and was used to measure ionic spectral lines in H II regions (S III at 18.7 microns). It was later used extensively on NASA C-141 Observatory to make observations of numerous objects including H II regions, planetary nebulae, stars with circumstellar shells, the galactic center and extragalactic objects. The spectrometers are described including the major innovations and a list of the scientific contributions. S.L.

N82-21055*# Boeing Aerospace Co., Seattle, Wash.
STUDY OF FIBER OPTICS STANDARDIZATION, RELIABILITY, AND APPLICATIONS Final Report
Jan. 1980 142 p refs
(Contract NAS8-33564)
(NASA-CR-161477; NAS 1.26:161477; D180-25821-1) Avail: NTIS HC A07/MF A01 CSCL 20F

The use of fiber optics in space applications is investigated. Manufacturers and users detailed the problems they were having with the use or manufacture of fiber optic components. The general consensus of all the companies/agencies interviewed is that fiber optics is a maturing technology and will defnitely have a place in future NASA system designs. The use of fiber optics was found to have two main advantages - weight savings and increased bandwidth. B.W.

N82-21056# Army Engineer Topographic Labs., Fort Belvoir, Va.
SCATTERING FROM A VEGETATION LAYER WITH AN IRREGULAR VEGETATION SOIL BOUNDARY Progress Report, Jun. 1979 - Jun. 1980
Richard A. Hevenor Oct. 1981 117 p refs
(DA Proj. 4A1-61102-B-52C)
(AD-A109138; ETL-0270) Avail: NTIS HC A06/MF A01 CSCL 20/6

A theoretical model is computed for the backscattering of electromagnetic waves from a layer of vegetation by using a first order renormalization technique to determine volume scattering. The vegetation soil interface is assumed rough according to the tangent plane approximation and the scattering from this boundary is added incoherently to the volume scattering result. The mean wave in the vegetation is obtained using an approximation of the Dyson's equation. A free space dyadic Green's function is used, along with a correlation function of the dielectric fluctuations that are exponential in form and that also possess different correlation lengths. Effective propagation constants are obtained for both horizontal and vertical polarization. The scattered wave is solved for by using a two dimensional Fourier transform technique, and the boundary conditions at either end of the vegetation layer are matched. The far field backscatter coefficients are compared for both horizontal and vertical polarizations. The mean and variance of the dielectric fluctuations are calculated. The theory is matched to experimental data taken from a corn field. Comparisons between the theoretical and experimental results over this time period are shown. GRA

N82-21057# Naval Academy, Annapolis, Md. Dept. of Physics.
RADIATION EFFECTS ON TRANSMISSION IN OPTICAL FIBER SYSTEMS Final Report, 1980 - 1981
William Hunter Hilarides 2 Jun. 1981 51 p refs
(AD-A109700; USNA-TSPR-110) Avail: NTIS HC A04/MF A01 CSCL 18/8

The effects of 14.7 MeV neutrons on transmission in optical fibers were studied. Monochromatic light in the spectral range from 700 to 1700 nanometers was used. Of the fibers studied, two were high purity silica fibers, and two were Germanium doped core silica fibers. An important result of the study was that the radiation induced damage was wavelength related. The induced damage decreased rapidly as the wavelength increased from 800 to 1100 nanometers, with minimal damage noted above 1300 nanometers. This trend was due primarily to the energy levels of traps formed as the bombarding neutrons broke bonds within the silica. Several other interesting trends were noted. First, the water content of the fiber affected the amount of damage. Second, the method by which the fiber was made affected the damage levels. Third, the dopant used affected the damage levels. These trends deserved further study, but because the data was was so small, more specific conclusions were not possible. GRA

N82-21058# Corning Glass Works, N.Y. Research and Development Div.
SINGLE MODE OPTICAL WAVEGUIDE DESIGN STUDY Final Report
Venkata A. Bhagavatula, Donald B. Keck, and Ralph A. Westwig 23 Nov. 1981 144 p refs
(Contract N00173-80-C-0563)
(AD-A109621) Avail: NTIS HC A07/MF A01 CSCL 20/6

With the extremely low losses attained in optical waveguides over the past three years, it is expected that graded index multimode systems with long repeater spacing will be dispersion limited. In that case the only recourse is to use single mode waveguides. To fully utilize this potential, the single mode waveguide design has to be simultaneously optimized with respect to total loss and bandwidth of the system. Since the bandwidth of a single mode waveguide is considered sufficiently high for most telecommunication applications, the present work has concentrated on total waveguide loss as would be experienced in a real system. The objective of this study is to experimentally determine the step index single mode fiber loss dependence, by

all mechanisms likely to be experienced practically, upon the key fiber design parameters, core diameter (2a) and fractional index difference (delta). Only with this systematic and comprehensive data base, will a rational choice of and/or criteria for choosing fiber design parameters optimized for a given application be obtained. GRA

N82-21059 North Carolina State Univ. at Raleigh.
AN EXPERIMENTAL DETERMINATION OF OPTICAL PATH INHOMOGENEITIES OF GLASS FILM SUBSTRATES Ph.D. Thesis
George Martin Russwurm 1981 66 p
Avail: Univ. Microfilms Order No. 8128550

A set of lime glass 649-0 Kodak photographic plates was examined for optical path inhomogeneities by using a Mach Zehnder interferometer. The interferometer design and final construction are discussed along with a method for overcoming the apparent half wavelength ambiguity of the instrument. Measurements of the variability of the optical path through this set of plates show that the average distance over which the optical path varies by 1/2 wavelength is 1.81 mm, and that the emulsion plays no significant role in this variability. If these plates were to be used to create diffraction patterns useful in spatial frequency filtering, then the maximum usable area is about 1 sq cm, while measurable degradation of resolution and contrast, would occur using an area of 4 sq cm if these plates were to be used in transmission holography. Dissert. Abstr.

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.

For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N82-21060 British Library Lending Div., Boston Spa (England).
SOME METHODS OF PLASMA DIAGNOSTICS IN NON-CIRCULAR CROSS-SECTIONAL TOKAMAKS WITH DIVERTORS
N. N. Brevnov, V. F. Denisov, V. G. Zhukovskii, E. S. Nikulin, A. S. Savelov, and V. V. Khilil 23 Jan. 1981 62 p refs Transl. into ENGLISH of the Rept. IAE-3073 Kurchatov Inst. of Atomic Energy, Moscow, 1978
(BLL-CTO-1889-(9091.9F); IAE-3073) Avail: British Library Lending Div., Boston Spa, Engl.

The plasma density was measured using multichannel microwave interferometers with oblique probing of the plasma. It is proposed that the plasma density should be measured along the major axis of the cross-section using a laser interferometer with mode competition (KRIOP). The plasma density was measured in the divertor channel. A reflection microwave interferometer was used to investigate the position, motion and stability of the plasma boundary (divertor) surface. Various methods of measuring the plasma velocity in the divertor channel were studied. An experimental investigation was made of the measuring channel noise in the two-beam technique which can be used to measure the poloidal magnetic fields in the plasma. Author

N82-21061 British Library Lending Div., Boston Spa (England).
RECONSTRUCTION OF THE SPATIAL PLASMA DENSITY DISTRIBUTION IN A TOKAMAK WITH A NONCIRCULAR PLASMA CROSS SECTION
N. N. Brevnov, Yu. N. Dnestrovskii, V. G. Zhukovskii, and E. S. Lyadina 23 Jan. 1981 20 p refs Transl. into ENGLISH of Rept. IAE-3074 Kurchatov Inst. Atomnoy Energii, Moscow, 1978
(BLL-CTC-1888-(9091.9F); IAE-3074) Avail: British Library Lending Div., Boston Spa, Engl.

A method of reconstructing the spatial plasma density distribution in the two dimensional case was developed using additional experimental information obtained from measurements of phase shifts by plasma probing along oblique channels. The experiment was simulated by computer to investigate the stability of the method and the reconstruction accuracy. Solutions were obtained for different types and different magnitudes of measurement error. The reconstruction accuracy was studied as a function of the number of straight and oblique probing channels. It is shown that oblique probing is always justified. The variation in the solution was studied for different variations in the noise simulating the measurement error. T.M.

N82-21062 British Library Lending Div., Boston Spa (England).
INFLUENCE OF THE PLASMA SHEATH POTENTIAL ON INFLUX OF IMPURITIES IN PRESENT-DAY FUSION FACILITIES
V. S. Voitsenya, S. I. Solodovchenko, and V. I. Tereshin 3 Sep. 1981 88 p refs Transl. into ENGLISH of Rept. KhFTI-81-24 Kharkov Physico-Technical Inst., USSR, 1981
(BLL-CTO-1972-(9091.9F); KhFTI-81-24) Copyright. Avail: British Library Lending Div., Boston Spa, Engl.

Analysis experimental results on plasma-surface interaction obtained in existing fusion facilities shows that the potential produced in the boundary layer between the plasma and the surface (sheath potential) plays an important part in the processes taking place during this interaction. Breakdown of the boundary layer results in the formation of unipolar arcs which cause severe surface erosion. The sheath potential is responsible for another mechanism of surface damage, i.e., sputtering by ions accelerated in this layer. A particularly important part is played by multiply charged impurity ions in the plasma. It is confirmed that multiply charged impurity ions are present near the surface and play a predominant part in sputtering of the wall material. Methods of suppressing unipolar arcing and of reducing sputtering of the surface material are discussed. A.R.H.

N82-21063 British Library Lending Div., Boston Spa (England).
FORECASTING THE TECHNICAL AND ECONOMIC CHARACTERISTICS OF HIGH POWER THERMONUCLEAR TOKAMAK REACTORS
A. N. Karkhov and B. P. Maksimenko 24 Jun. 1981 22 p refs Transl. into ENGLISH from Atomnaya Tikh. za Rubeshom (USSR), no. 3, 1980 p 19-28
(BLL-CTO-1921-(9091.9F)) Avail: British Library Lending Div., Boston Spa, Engl.

Methods for making parametric investigations of Tokamak power reactors by predicting their technical and economic parameters to determine the direction in which the concept will develop are examined. High temperature plasma physics, the engineering and technical development of Tokamak reactor concepts, mathematical models of individual systems and subsystems, and computational programs developed for the parametric investigations are examined. R.J.F.

N82-21064*# National Aeronautics and Space Administration, Washington, D. C.
ION-CYCLOTRON TURBULENCE AND DIAGONAL DOUBLE LAYERS IN A MAGNETOSPHERIC PLASMA
V. A. Liperovskiy, M. I. Pudovkin, G. A. Skuridin, and S. L. Shalimov Oct. 1981 63 p refs Transl. into ENGLISH of Russian Rept. Pr-609 Inst. of Space Research, Moscow, 1980 p 1-71 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASw-3542)
(NASA-TM-76742; PR-609; NAS 1.15:76742) Avail: NTIS HC A04/MF A01 CSCL 20I

A survey of current concepts regarding electrostatic ion-cyclotron turbulence (theory and experiment), and regarding inclined double potential layers in the magnetospheric plasma is presented. Anomalous resistance governed by electrostatic ion-cyclotron turbulence, and one-dimensional and two-dimensional models of double electrostatic layers in the magnetospheric plasma are examined. B.W.

N82-21065# Maryland Univ., College Park. Lab. for Plasma and Fusion Energy Studies.
COALESCENCE OF SPHEROMAKS
Allan Reiman Jul. 1981 45 p refs Sponsored in part by NRL
(AD-A109854; PL-82-005; PUB-82-021) Avail: NTIS HC A03/MF A01 CSCL 18/1

The coalescence of two spheromaks is described using the quasi-ideal model of reconnection. Nonaxisymmetric effects are found to play an important role in general. Possible applications of repeated coalescence are studied, including heating the spheromak plasma, building up a large spheromak from smaller

ones, and maintaining a spheromak in steady state. The analysis suggests that coalescence experiments could also provide a valuable method for studying magnetic field relaxation.
Author (GRA)

N82-21066# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
POSSIBILITIES OF LAMINARIZATION OF ELECTROHYDRODYNAMIC FLOWS
Ye. P. Udartsev 16 Dec. 1981 10 p refs Transl. into ENGLISH from Gidroaerodin. Nesushchikh Poverkhn. (USSR), 1966 p 297-300
(AD-A109665; FTD-ID(RS)T-1296-81) Avail: NTIS HC A02/MF A01 CSCL 20/9

The use of electrohydrodynamic flows for active influence on the boundary layer is discussed. The stability of electrohydrodynamic flows was examined. It is shown that electrophysical action can lead both to increase of the critical Reynolds number and to its decrease. Raising the critical Reynolds number - laminarization of flow - was examined in linear formulation by methods using the theory of hydrodynamic stability. T.M.

N82-21067# Power Conversion Technology, Inc., San Diego, Calif.
EXPLORATION OF THERMAL SELF-FOCUSING IN A PLASMA Final Report, 1 Apr. - 30 Sep. 1981
31 Oct. 1981 19 p
(Contract DE-AC03-80ER-10734)
(DE82-003014; DOE/ER-10734/T1) Avail: NTIS HC A02/MF A01

Power dependent radio propagation through a plasma (equivalent to about 20km of ionosphere) was measured under conditions suggesting a much faster plasma response than expected. A power dependent phase shift, and the spatial distribution of the power affected propagation are investigated. The spatial exploration confirms single point measurements, and results in a measurement of power dependent relative intensity. Findings are of importance to over the horizon radar. DOE

N82-21068# Argonne National Lab., Ill.
TECHNICAL SUPPORT FOR OPEN-CYCLE MHD PROGRAM Progress Report, Jul. - Sep. 1980
G. F. Berry, ed. Jul. 1981 127 p refs
(Contract W-31-109-eng-38)
(DE82-003009; ANL-MHD-80-16) Avail: NTIS HC A07/MF A01

The component and system was analysed and the two subtasks: (1) component modeling of the combustor nozzle channel-diffuser topping train; (2) modeling of all downstream components and for the system analyses of the MHD power plant. The high performance demonstration experiment and the development and testing of a three dimensional computer model, infinite segmentation electrical solution are analyzed. Progress on the development of a fully three dimensional gasdynamic generator model is reported. A discussion of off design methodology is presented. Advances in system code models are described, and work on NO/sub x/ kinetics and mixing models for secondary combustion is reviewed. DOE

N82-21069 Michigan Univ., Ann Arbor.
INVESTIGATION OF PARAMETRIC INSTABILITIES IN PLASMAS INDUCED BY STOCHASTIC PUMPS Ph.D. Thesis
Ahmed-Hafid Belbachir 1981 194 p
Avail: Univ. Microfilms Order No. 8125065

The effect of stochastic pumps on the parametric instabilities in plasmas is investigated. The parametric instabilities can be interpreted simply as the decay of a pumping mode into two other unstable plasma modes. The stochastic coupled mode equations describing these instabilities are derived from Maxwell's equations, the continuity, and momentum equations of the two fluid description for a homogeneous unmagnetized plasma. The equations for the 'mean' are obtained by taking the ensemble average of the stochastic coupled mode equations and employing the Bourret approximation to close the set of hierarchical equations. Therefore the effect of the stochasticity of the pump is correctly taken into account in the mean value equations. One aspect of the effect of the stochastic pump on parametric instabilities was considered which is the pump bandwidth effect for perfect frequency matching. The common result of these works is that the increasing pump bandwidth increase the threshold for instability and the undesirable instabilities can effectively be controlled by increasing the bandwidth of the pump. Dissert. Abstr.

N82-21070 Texas Univ. at Arlington.
SIMULATIONS OF NONLINEAR PROBLEMS IN PLASMA PHYSICS Ph.D. Thesis
David Walker Brock 1981 209 p
Avail: Univ. Microfilms Order No. 8128605

Nonlinear effects for two types of plasma waves were studied using computer simulation methods. The first problem is the long time evolution of a spectrum for current driven ion acoustic waves, which was studied using mode simulation techniques in k-space. The second problem is the growth of toroidal drift waves which was studied using fluid simulations. For these plasma waves, nonlinear effects appear at high amplitudes leading to the development of wave properties which are considerably different from those which are present at lower amplitudes. The nonlinear characteristics such as the spectral distribution in k omega of these two types of waves are discussed.
Dissert. Abstr.

N82-21071 Rensselaer Polytechnic Inst., Troy, N. Y.
EFFECT OF IMPURITIES ON RADIATION LOSS IN THE RPI TOKAMAK Ph.D. Thesis
Thomas Robert Price 1981 194 p
Avail: Univ. Microfilms Order No. 8200469

Gross changes in the impurity radiation as it relates to vacuum and plasma conditions are considered. Plasmas were studied during the conditioning period after a major vacuum opening when high impurity conditions were present. These plasmas then evolved into lower impurity density discharges as the machine base pressure dropped. For the discharges observed during conditioning, radiation loss was the dominant loss channel (more than 50 percent of the input power lost as radiation). It is concluded that the impurity conditions led to a broad temperature profile for the conditioning plasmas which evolved into a more peaked profile for the later discharges. For peaked profiles, the position of peak radiation loss would move outward in radius due to the heating plasma. As the peak moved to a region of lower electron density, a corresponding drop in the radiation signal would be expected. Dissert. Abstr.

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N82-21072 Northwestern Univ., Evanston, Ill.
CHARACTERIZATION OF DEEP LEVEL DEFECTS IN ZINC SELENIDE BY TRANSIENT CAPACITANCE SPECTROSCOPY Ph.D. Thesis
Paul Raymond Besomi 1981 228 p
Avail: Univ. Microfilms Order No. 8124853

The heteroepitaxial growth of ZnSe on GaAs substrates was obtained by chemical vapor transport in a H2 gas flow. A model of quasi-equilibrium thermal decomposition of the ZnSe source and transport of the gaseous species quantitatively explains the kinetics results obtained. The epitaxial layers were characterized by X-ray diffraction and SEM channeling patterns. Photocapacitance spectra response measurements indicated the presence of deep acceptor states. Deep electron traps were detected by transient capacitance spectroscopy. Their activation energy, cross-section and concentration were determined as well as the temperature dependence of the cross-sections. A model of selenium vacancies and divacancies was also developed to explain the behavior and nature of the deep electron traps observed. The photovoltaic properties of ZnSe/GaAs n-p heterojunctions were investigated, and solar cells with efficiency of 5-7% were obtained under a simulated solar illumination of 75 mW/square centimeter. Native defects in concentrations as high as 5 x 10 to the 18th power cubic centimeters are present

in ZnSe, where selenium vacancies introduced shallow donor levels and zinc vacancies deep acceptor levels in the band-gap. Dissert. Abstr.

N82-21073 Iowa State Univ. of Science and Technology, Ames.
PROXIMITY EFFECT IN Cu-Nb-Sn COMPOSITES Ph.D. Thesis
Shelly Sit-Ling Shum Eucker 1981 94 p
Avail: Univ. Microfilms Order No. 8128813

Heat capacities were measured in the presence of magnetic fields for Cu-Nb and Cu-Nb3Sn in situ composites in order to determine the size of the superconducting pair potential which is induced in the normal Cu region as a function of magnetic field. For the Cu-Nb composites the induced pair potential is found to be about 0.35 meV in zero field, in agreement with de Gennes boundary conditions. With the application of a magnetic field, the energy gap declines quickly and above about 17 mT the Cu behaves as a gapless superconductor. Dissert. Abstr.

N82-21074 New York Univ., N. Y.
ELECTRON SPIN AND ENERGY RELAXATION IN HIGHLY PHOTOEXCITED GALLIUM ARSENIDE Ph.D. Thesis
Robert John Seymour 1981 159 p
Avail: Univ. Microfilms Order No. 8127966

The electron-lattice interactions under conditions appropriate to laser annealing and very large scale integrated circuits are measured. The spin and energy relaxation of the conduction electrons in GaAs following intense picosecond photoexcitation are also measured. Since these processes occur on picosecond time scale, mode locked solid state lasers (ruby and Nd:glass) are used as the photoexcitation sources and resulting photoluminescence is calculated with a streak camera system. The results show the changes that occur in these fundamental processes when the carrier densities become large (one octillion to one nonillion cu cm.) The dominant spin relaxation mechanism under the conditions of intense excitation is due to the k dependent spin orbit splitting of the conduction band which causes a precession of the electron spin. This mechanism dominates despite the extreme collisional narrowing that occurs at high carrier densities. Dissert. Abstr.

N82-21075# Ceres Corp., Waltham, Mass.
GROWTH OF HIGH PURITY OXYGEN-FREE SILICON BY COLD CRUCIBLE TECHNIQUES Interim Report, 18 May 1980 - 30 May 1981
Joseph F. Wenckus and Wilson P. Menashi Griffiss AFB, N.Y. RADC Oct. 1981 49 p refs
(Contract F19628-80-C-0104; AF Proj. 4600)
(AD-A108632; RADC-TR-81-280) Avail: NTIS HC A03/MF A01 CSCL 20/2

A detailed evaluation of previous research on cold crucible technology, the design and construction of a cold crucible assembly and the investigation of the growth of single crystals of high purity silicon using the water-cooled cold crucible is included. A theoretical analysis was carried out on the thermodynamics and heat flow characteristics within the melt confined in the cold crucible to develop a better understanding of the crystal growth process. A water-cooled copper cold crucible which incorporates a bottom-feeding mechanism, was designed, constructed and tested. Silicon melts can be routinely melted using low frequency induction heating (approx. 250-300 Khz) and confined within the cold crucible for extended periods without contamination. Seeding techniques were developed to permit the Cz growth of single crystals of silicon with lengths up to 100 mm and diameters in excess of 25 mm. It appears that the purity levels of single crystals produced are equal to or better than the purity level of the polycrystalline feed material. GRA

N82-21076# Naval Academy, Annapolis, Md. Dept. of Physics.
THE USE OF PLASTIC CRYSTALS AS PRESSURE CALIBRATION DEVICES Final Report, 1980 - 1981
Mark E. Middleton 2 Jun. 1981 64 p refs
(AD-A109702; USNA-TSPR-113) Avail: NTIS HC A09/MF A01 CSCL 20/2

The permittivity of carbon tetrachloride, cyclohexane, and cyclohexanol has been studied at audio frequencies and various pressures and temperatures. The permittivity of the liquid phase was determined to agree well with previous work. The first measurements on carbon tetrachloride in the superpressed state were performed and it was determined that the superpressed state is an extension of the liquid phase with no anomalies. Because of the superpressing, the liquid to rhombohedral phase transition is unacceptable as a possible pressure fixed point. However, the rhombohedral to liquid transition is well defined and could make a good transfer point. In addition, the variation of permittivity of liquid carbon tetrachloride with pressure is found to be extremely reproducible and thus could be used as a pressure gage. Finally, the melting of the rhombohedral phase was found to be diffuse. This property was found to be intrinsic to carbon tetrachloride and several explanations of the behavior are proposed. Author (GRA)

N82-21077# Naval Academy, Annapolis, Md. Dept. of Physics.
CHARACTERIZATION OF TRAPPING STATES IN SEMICONDUCTORS Final Report, 1980 - 1981
Harvey S. Hopkins 2 Jun. 1981 102 p refs
(AD-A109701; USNA-TSPR-111) Avail: NTIS HC A06/MF A01 CSCL 20/12

Defect energy states within the band gap affect the performance of semiconductor response time. A characterization of defects to benefit diode performance was made. Characterization includes the energy differences from the band edge, and the capture cross section of the energy state. Deep Level Transient Spectroscopy (DLTS) a method using the transient capacitance properties of reverse-biased p-n junction diodes to characterize defects was studied using two different DLTS experimental setups. A complex model is proposed for the DX center consisting of a group plus an excited state with independent capture cross sections and communication between the two levels. Since classical analysis of DLTS data yielded misleading results when a complex trap was considered, a computeer simulation and curve fitting technique was used to determine the trap structure and parameters. This technique gave values for the ground state energy, for the excited state, prefactor values on the ground, excited, and communication prefactor. GRA

N82-21078# California Inst. of Tech., Pasadena.
CRYSTAL GROWTH IN SUBSTRATE CONFINED LIQUIDS Report, 15 Jun. - 15 Dec. 1981
J. O. McCaldin 15 Dec. 1981 18 p refs
(Contract MDA903-81-C-0354; ARPA Order 4284)
(AD-A109620) Avail: NTIS HC A02/MF A01 CSCL 20/2

Crystal growth techniques utilizing substrate confined liquids (S.C.I.) were developed. The crystals were grown as arrays of single crystals and included semiconductor crystals useful as detectors. The primary technical problem was to learn how to produce stable arrays of pools of liquid in the substrate surface (S.C.I.) and to grow a single crystal from each liquid pool. The approach to the problem was primarily experimental. It was found that germanium appears to nucleate within the fluid phases rather than at the substrate/liquid interface. The implication or this for further research is that there is a possibility of align crystals grown from S.C.I. Most hardware development at this time has to do with pattern design for the substrates and the subsequent processing of the substrates. GRA

N82-21079# Stanford Univ., Calif. Electronics Lab.
STUDIES OF SURFACES AND INTERFACES ON 3-V COMPOUNDS USING UV AND SOFT X-RAY EXCITATION
William E. Spicer and Ingolf Lindau 1981 2 p refs
(Contract N00014-75-C-0289)
(AD-A109429) Avail: NTIS HC A02/MF A01 CSCL 07/4

The bulk and surface electronic structure of III-V semiconductors, their interfaces with metals, insulators, and other semiconductors, and their application to a variety of electronic and opto-electronic device structures were studied. Atomically clean semiconductor surfaces are often prepared by cleaving single crystals in situ under ultrahigh vacuum conditions or by ion sputtering, heat cleaning, laser treatment, etc. These surfaces are then characterized by techniques, including: angle resolved and angle integrated ultraviolet (UPS) and X-ray (XPS) photoelectron spectroscopies (often using synchroton radiation as the light source), Auger electron spectroscopy, low energy electron diffraction, contact potential difference measurements (using the

Kelvin probe method), and photoluminescence. The chemical, electronic, and structural interactions of the semiconductor surface with adsorbers were studied by exposing the clean surface to gases or to atomic or molecular fluxes of some other substance. Exposures were carried out on heated on cooled substrates, under laser irradiation, or were influenced by a variety of other controlled perturbations. GRA

N82-21080# Mindlin (Raymond D.), Ridgefield, Conn.
THIRD OVERTONE QUARTZ RESONATOR
Raymond D. Mindlin 30 Nov. 1981 21 p refs
(Contract N00014-80-C-0559)
(AD-A109619; TR-1) Avail: NTIS HC A02/MF A01 CSCL 20/2

The Lee-Nikodem equations of motion of elastic plates are solved for the case of vibrations of an AT-cut quartz strip, with free faces and edges, at frequencies up to and including the third harmonic thickness-shear overtone. Author (GRA)

N82-21081# Rockwell International Corp., Thousand Oaks, Calif. Microelectronics Research and Development Center.
EFFECTS OF SURFACE CONDITIONS ON CARRIER TRANSPORT IN III-V COMPOUNDS Final Report, 1 Sep. 1978 - 1 Mar. 1981
R. W. Grant, S. P. Kowalcyik, J. R. Waldrop, W. A. Hill, and E. A. Kraut Wright-Patterson AFB, Ohio AFWAL Nov. 1981 113 p refs
(Contract F33615-78-C-1532; AF Proj. 2306)
(AD-A109703; ERC41012.102FR; AFWAL-TR-81-1200) Avail: NTIS HC A006/MF A01 CSCL 20/8

Surface chemical and potential measurements carried out by XPS (X-ray photo-emission spectroscopy) are reported for several GaAS materials. The GaAs samples had (100) and (110) orientations, n- and p-type doping, and both bulk and VPE grown materials were studied. Various surface treatments which included chemical etching, annealing, oxidation, gas exposure, and deposition of materials were investigated. The thermal cleaning process was shown to be associated with the surface chemical reaction As2O3 + 2GaAs yields Ga2O3 + (4/x)As(x) gas. A variation in GaAs interface Fermi-level position of up to 0.7 eV was observed. The difference in interface Fermi-level position for n- and p-type samples subjected to identical surface treatments was observed to be nearly constant at approx. = 0.3 eV. A single defect model with multiple charge states is suggested as the simplest explanation for the observed interface-potential variations. Progress toward the development of a contactless C-V apparatus is described. Author (GRA)

N82-21082# Universidad Autonoma de Madrid, Cantoblanco (Spain). Dept. de Optica y Estructure de la Materia.
IMPURITY AGGREGATION PROCESSES AND M:.CHANICAL BEHAVIOR IN SOLID DIELECTICS Final Report, 1 Sep. 1979 - 31 Aug. 1981
Fernando Aguillo-Lopez 30 Nov. 1981 61 p refs
(Grant AF-AFOSR-0115-79; AF Proj. 2301)
(AD-A109604; EOARD-TR-82-2) Avail: NTIS HC A04/MF A01 CSCL 20/2

The aggregation and precipitation processes of divalent cation impurities in alkali halides have been followed by optical spectroscopy as well as ionic thermocurrent methods. In particular, a number of absorption and luminescence bands have been ascribed to well-defined precipitated phases. The influence of these precipitation processes on mechanical (yield-stress) behavior has been investigated and the different role of stable and metastable phases has been clearly differenciated. GRA

N82-21083# Virginia Univ., Charlottesville. Dept. of Materials Science.
DEPTH DISTRIBUTION OF DISPLACEMENT DAMAGE IN ALPHA-IRON UNDER TRIPLE BEAM ION IRRADIATION
L. L. Horton, J. Bently (ORNL), and W. A. Jesser 1981 5 p refs Presented at the Fusion Reactor Mater. Meeting, Seattle, Wash., 9 Aug. 1981
(Contract W-7405-eng-26)
(DE81-028563; CONF-810831-26) Avail: NTIS HC A02/MF A01

The depth dependence of the defect structures was determined for iron irradiated at 850 K with 4 MeV Fe2+ and energetic helium and deuteron ions to 10 dpa and fusion levels of helium and deuterium. From the damage profiles, a sectioning depth of 0.9 microns was selected for studies of iron and bcc iron alloys, such as ferritic steels, utilizing similar irradiation parameters. A comparison of the experimental damage profile to the deposited energy and deposited ion profiles calculated by E-dEP-1 indicated a possible overestimate of the LSS stopping power of at least 22%. DOE

N82-21084# Northwestern Univ., Evanston, Ill. Dept. of Chemical Engineering.
SOLID-STATE, SURFACE, AND CATALYTIC PROPERTIES OF OXIDES Progress Report, 1 Nov. 1980 - 31 Aug. 1981
Harold H. Kung Aug. 1981 13 p refs
(Contract DE-AS02-78ER-04987)
(DE81-030940; DOE/ER-04987/T1;
COO-DE-AC02-78ER-4987-2) Avail: NTIS HC A02/MF A01

Catalysis by transition metal oxides was investigated and four areas are emphasized. In the first area, an adsorbed oxygen species on iron oxide was characterized. This species desorb, with an activation energy of 38 kcal/mole, and it has a coverage of 1.4 x 10(16) molecules/m(2). Its desorption follows a second order kinetics suggesting that it is an atomic species. The high activation energy suggests that the species may only be active in total oxidation. In the second area, ZnO surfaces containing controlled defects in the form of steps were studied. It is found that the nonpolar flat a stepped and a polar surface behave differently. The CO2 adsorbs with increasing strength on these three surfaces in this order. Methanol does not decompose on a stoichiometric. The stepped surface is active in methanol decomposition in the manner like the vacancy. DOE

N82-21085 State Univ. of New York at Albany.
ELECTRONIC PROPERTIES OF SOME TWO DIMENSIONAL AND QUASI-TWO DIMENSIONAL SYSTEMS Ph.D. Thesis
Mahendra Kumar Mallick 1981 92 p
Avail: Univ. Microfilms Order No. 8127171

The surface states of a crystalline solid are studied. The computer renormalization group technique is applied to a crystal surface. In applying this method to the unrelaxed and relaxed Si(111)1X1 surface, accurate and stable results for the surface states are shown with a quite substantial reduction in the computation time. The trends of the electronic structure and bonding in graphite and stage 1 and 2 lithium graphite intecalation compounds are investigated with special emphasis on charge transfer effects. The tight binding extended Hueckel theory(TB-EHT) is used. It is also shown that the simple TB-EHT provides a very good description of the Fermi surface properties in these systems. Dissert. Abstr.

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

No abstracts in this category.

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N82-21086# Council for Scientific and Industrial Research, Pretoria (South Africa). Production Engineering Advisory Service.

MINI-SEMINAR ON VALUE ENGINEERING

Apr. 1981 61 p refs Presented in Pretoria, 1981; sponsored by the Value Engineering and Management Society of South Africa

(CSIR-TSD-0002/81; ISBN-0-7988-2078-0) Avail: NTIS HC A04/MF A01

Various aspects of value engineering are considered. For individual titles, see N82-21087 through N82-21091.

N82-21087# South African Bureau of Standards, Pretoria. Design Inst.

WHY DOES VALUE ANALYSIS WORK?

G. Bodman *In* CSIR Mini-Seminar on Value Eng. Apr. 1981 p 1-10 (For primary document see N82-21086 11-81)

Avail: NTIS HC A04/MF A01

Value Analysis, Value Engineering, and Value Management, a disciplined analytical thinking process aimed at achieving high levels of effectiveness in decision making is discussed. It provides the capacity to generate a large number of alternatives prior to decision making and so renders decision making highly effective. Since decision making is rooted in the definition and choice of options, the Value disciplines provide a method of proliferating options. N.W.

N82-21088# Value Engineering Ltd., Pretoria (South Africa).

ANALYSIS OF PROBLEMS AND IDENTIFICATION OF PRIORITIES

H. K. vanHeerden *In* CSIR Mini-Seminar on Value Eng. Apr. 1981 10 p (For primary document see N82-21086 11-81)

Avail: NTIS HC A04/MF A01

The implicit identification of functions is addressed. These functions are objectively analyzed to establish their relative descending order of importance, providing a different way of looking at what is under consideration and establishing a Pareto-type curve. Numerical evaluation is used. N.W.

N82-21089# National Productivity Inst., Pretoria (South Africa). Human Resources Div.

CREATING MORE EFFECTIVE ALTERNATIVES

T. Taylor *In* CSIR Mini-Seminar on Value Eng. Apr. 1981 7 p (For primary document see N82-21086 11-81)

Avail: NTIS HC A04/MF A01

Overcoming barriers to creative thinking is discussed. Barriers include pressures to conform, to be logical, appearance, security, authority, and fear of failure. Procedures include forming a value team, withholding judgement, and imagination. A poem by S. W. Foss entitled 'The Calf Path' is included. N.W.

N82-21090# Kimex (Proprietary) Ltd., Pretoria (South Africa).

ORGANIZING TEAM THINKING

G. J. Scholtz *In* CSIR Mini-Seminar on Value Eng. Apr. 1981 23 p refs (For primary document see N82-21086 11-81)

Avail: NTIS HC A04/MF A01

Organized group thinking is considered. The importance of communication is emphasized with a biblical quotation. N.W.

N82-21091# Joy Mfg. Co. (Proprietary) Ltd., Pretoria (South Africa). Value Engineering Dept.

BENEFITS ACHIEVED THROUGH THE APPLICATION OF VALUE ANALYSIS

R. A. Stringer *In* CSIR Mini-Seminar on Value Eng. Apr. 1981 7 p refs (For primary document see N82-21086 11-81)

Avail: NTIS HC A04/MF A01

Four phases, under which value analysis operates, are considered. These are the information phase, the function phase, the creation phase, and the implementation phase. N.W.

N82-21092# Committee on Science and Technology (U. S. House).

NASA PROGRAM MANAGEMENT AND PROCUREMENT PROCEDURES AND PRACTICES

Washington GPO 1981 162 p Hearings before the Subcomm. on Space Sci. and Applications of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 16, 24-25 Jun. 1981

(GPO-82-309) Avail: Subcomm. on Space Sci. and Applications

The National Aeronautics and Space Administration's program management and procurement policies and practices as they relate to research and development programs are reviewed. Project cost growth and schedule slippage are examined and numerous recommendations are given. R.J.F.

N82-21093# Texas Univ. at Arlington.

RAPID RESPONSE ALGORITHMS FOR OPTIMIZING THE UTILIZATION OF HUMAN RESOURCES IN FLIGHT CREWS: SCHEDULING AIRCREWS TO AIRCRAFT

R. Armstrong, A. Charles, M. Kress, and S. Samn Jul. 1981 16 p refs Sponsored in part by Texas A&M Univ.

(AD-A109149; CCS-400) Avail: NTIS HC A02/MF A01 CSCL 05/1

Consider an airlift operation which consists of several routes, each having missions which are subject to given time schedules. The aircraft are manned with aircrews that are required to rest for a certain period of time after each leg of a mission. A mission may be continued whenever a rested aircrew is available at the location. Given the number of missions that are needed to be flown on the different routes, and given the schedule timetable that is associated with those missions, we consider the problems: (1) What is the minimum number of crews that are needed to maintain the operation? (2) How many aircrews are needed to be staged at each location? (3) If the number of available aircrews is less than the minimum needed, which legs of what missions may be delayed so that the minimum required number of aircrews is reduced? We will exclude from the analysis the trivial case where the rest period of the aircrews is always less than the period of time for which the aircrafts are delayed. If this is the case, then it is clear that the minimum number of aircrews is equal to the number of missions and all the aircrews must be staged initially at the home base. GRA

N82-21094# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

IDENTIFICATION OF AN ADAPTABLE COMPUTER PROGRAM DESIGN FOR ANALYZING A MODULAR ORGANIZATIONAL ASSESSMENT INSTRUMENT M.S. Thesis

James B. Bushman Sep. 1981 194 p refs

(AD-A109879; AFIT-LSSR-50-81) Avail: NTIS HC A08/MF A01 CSCL 05/1

The purpose of this study was to identify an adaptable computer program design for analyzing the data collected by the Organizational Assessment Package (OAP) which would be responsive to the needs of management consultants within the Air Force. The system described provides consultants with a means by which potential problem areas within Air Force organizations can be identified, thus increasing the consultant's efficiency during the diagnostic phase. The system is flexible in that it will accept survey data from a wide range of survey structures. This feature provides consultants with a means by which the analysis of an organization can be tailored to the specific needs and problems of the organization. The development and implementation of this system will provide a means for the management consultants to better serve commanders throughout the Air Force and improve the overall effectiveness of the Air Force. Author (GRA)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

N82-21095# General Electric Co., Philadelphia, Pa. Space Systems Div.

EVALUATING DATA BASE MANAGEMENT SYSTEMS
Edward Davidson 3 Nov. 1981 24 p
(Doc-81SDS030) Avail: General Electric Co., Space Systems Div. Library, P.O. Box 8555, Philadelphia, Pa. 19101

A methodology developed and successfully utilized for the evaluation and selection of data base management software is described. The basic methodology can be utilized in the evaluation of other types of software. The evaluation and selection criteria are discussed. B.W.

N82-21096# Committee on Science and Technology (U. S. House).
THE INFORMATION SCIENCE AND TECHNOLOGY ACT
Wasington GPO 1981 374 p refs Hearings on H.R. 3137 before the Subcomm. on Sci., Res. and Technol. of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 25, 27-28 May and 9 Jun. 1981
(GPO-83-486) Avail: Subcomm. on Sci., Res. and Technol.

Testimony concerning the Information Science and Technology Act, HR 3137, is presented. Various government agencies, private corporations, and professional organizations were represented. N.W.

N82-21097# Naval Ship Research and Development Center, Bethesda, Md. Computation, Mathematics and Logistics Dept.
NAVY TECHNICAL INFORMATION PRESENTATION SYSTEM (NTIPS) TEST AND IMPLEMENTATION STRATEGY Final Report
Eric L. Jorgensen, Jr. Dec. 1981 69 p
(AD-A109446; DTNSRDC-81/094) Avail: NTIS HC A04/MF A01 CSCL 05/2

This report describes the strategy for the test and implementation of a newly designed comprehensive Navy-wide system for the definition, acquisition, generation, mastering, replication, distribution, delivery, and control of all Technical Information (TI) secured by the Department of the Navy for delivery with military hardware and used for the purposes of system operation, training, maintenance, and logistics support. This system was conceived and designed as an R&D effort and will be tested, prototyped, and fully implemented in the operational Department of the Navy in the FY 82 - FY 88 time period as outlined in this report. Author (GRA)

N82-21098# Federal Emergency Management Agency, Washington, D.C.
BIBLIOGRAPHY OF PUBLICATIONS Final Report
Apr. 1981 44 p Revised
(PB82-121641; TM-121-Rev-9) Avail: NTIS HC A03/MF A01 CSCL 05B

The purpose of this manual is to provide the user community with an up-to-date list of documents produced by the Office of Information Resources Management, Federal Emergency Management Agency (FEMA), and its predecessors. GRA

N82-21099# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Flight Mechanics Panel.
AGARD FLIGHT TEST INSTRUMENTATION SERIES. VOLUME 14: THE ANALYSIS OF RANDOM DATA
D. A. Williams (Cranfield Inst. of Technology), A. Pool, ed., and K. C. Sanderson, ed. Nov. 1981 168 p refs
(AGARD-AG-160-Vol-14; ISBN-92-835-1405-X) Copyright. Avail: NTIS HC A08/MF A01

The availability of powerful computing facilities, both on-line and off-line, for processing experimental data is addressed. It is shown that the flight test engineer has great flexibility in choosing the dividing line between 'hard wired' and 'soft' signal conditioning equipment. Further, the techniques described are used increasingly to extract meaningful information in situations where more conventional test and analysis techniques are inappropriate. For individual titles, see N82-21100 through N82-21107.

N82-21100# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
PRE-PROCESSING
In its AGARD Flight Test Instr. Ser., Vol. 14 Nov. 1981 p 1-43 (For primary document see N82-21099 11-82)
Avail: NTIS HC A08/MF A01

The specific requirements for an instrumentation system suitable for gathering random data are discussed. The answer to this question will depend upon the application. Random signals as a result of navigation errors, ILS approach path errors, structural loads resulting from take off and landing or flight in atmospheric turbulence, excitation by turbulent boundary layers or power plant exhausts, through to radio frequency interference were considered in terms of the design of a flight vehicle and demands of an instrumentation system. Questions which need answering before an adequate instrumentation system can be defined are delineated and discussed. Matters which may be looked upon as forming the interface between the raw measurements and the analysis proper are discussed. M.D.K.

N82-21101# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
ANALYSIS TECHNIQUES
In its AGARD Flight Test Instr. Ser., Vol. 14 Nov. 1981 p 44-83 (For primary document see N82-21099 11-82)
Avail: NTIS HC A08/MF A01

Techniques more commonly encountered when analyzing random data from flight trials are introduced and discussed. The techniques are explained at a heuristic level and, where possible, the mathematical specifications of the techniques are developed from this explanation. Mathematical development of the specifications from statistical principles is provided. Expressions which allow estimates to be made of the reliability of results obtained from each technique are also included. The properties of random signals and, in general terms, the implications of those properties are also discussed. M.D.K.

N82-21102# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
SOME APPLICATIONS OF RANDOM DATA ANALYSIS
In its AGARD Flight Test Instr. Ser., Vol. 14 Nov. 1981 p 84-114 refs (For primary document see N82-21099 11-82)
Avail: NTIS HC A08/MF A01

Examples and results which may be obtained from power and cross spectral analysis of random data results from flight trials are presented. Characteristics of the data, decisions of the engineer making the analysis, the details to be extracted from the data and the reliability of that detail were considered. Some examples of applications of random data analysis discussed include: measurements of atmospheric turbulence, analysis of records from flight flutter trials evaluation of aircraft ride and handling qualities, and reduction of random measurements to a form suitable for certification trials. Relationships intended to assist engineers in making the choice of analyzer bandwidth appropriate for a given length of record were also considered. Results extracted from analyses of two types of signal are presented to provide a 'feel' for the consequences of choosing any particular combination of analyser bandwidth and averaging time. The signals used for the analysis were a 'white' noise source band limited at 1 KHz., and a narrow band signal. Results which demonstrate the effect of 'Hanning' each block of data prior to analysis are also included. M.D.K.

N82-21103# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
THE FOURIER SERIES AND FOURIER TRANSFORM
In its AGARD Flight Test Instr. Ser., Vol. 14 Nov. 1981 p 115-127 (For primary document see N82-21099 11-82)
Avail: NTIS HC A08/MF A01

A good working knowledge of the principles of the Fourier series and Fourier transform is essential for developing routines for analyzing random data and for understanding fully the results produced by such routines. In recognition of this fact, an appendix containing an outline of the principles of both the Fourier series and the Fourier transform is presented. The strong relationship between the two when they are applied to sampled time sequences is demonstrated, and a list of properties is included which may be useful to the analyst who is engaged in applying the techniques to specific tasks. Author

N82-21104# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
THE FAST FOURIER TRANSFORM
In its AGARD Flight Test Instr. Ser., Vol. 14 Nov. 1981 p 128-135 refs (For primary document see N82-21099 11-82)
Avail: NTIS HC A08/MF A01

A variety of FFT algorithms were devised to attain a maximum of efficiency under particular circumstances, for example to make best use of the attributes of a particular type of computer. All such algorithms make assumptions regarding the length of the data sequence to be transformed. It is generally assumed that the length of the sequence is equal to some power of an integer number. There is evidence to suggest that the most efficient algorithm assumes a length which is equal to a power of eight. However, the majority of algorithms are based upon binary or 'power of two' lengths, i.e., N = 2p. The reasons for this accord are that binary algorithms are relatively simple to understand and encode, the resulting algorithms are compact, and they offer the user the greatest choice of N for a given size of computer store. Two specific binary algorithms are developed for an Appendix. The Cooley-Tukey algorithm was the first to be published in modern times, the second, known as the Sande-Tukey algorithm is a logical development of the first which be preferred in particular circumtances. Author

N82-21105# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
SOME PROCEDURES WHICH MAKE USE OF THE DFT
In its AGARD Flight Test Instr. Ser., Vol. 14 Nov. 1981 p 136-143 (For primary document see N82-21099 11-82)
Avail: NTIS HC A08/MF A01

An Appendix containing procedures for computing estimates of PSD and CSD from arrays of sampled data, and estimates of auto and cross correlation functions from estimates of PSD and CSD using the DFT as a filtering element is presented. The procedures were presented in a formal high level language. ALGOL 60 was adopted as the language for the Appendix. Procedures were designed to present the various steps in a logical manner and with a degree of clarity. It is worth noting that the procedures would translate into grossly inefficient code if they were to be compiled exactly as they were presented. M.D.K.

N82-21106# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
PROBABILITY MEASURES
In its AGARD Flight Test Instr. Ser., Vol. 14 Nov. 1981 p 144-154 (For primary document see N82-21099 11-82)
Avail: NTIS HC A08/MF A01

Random processes yield data whose values cannot be predicted with any certainty. The best that can be hoped for is a description which permits an estimate of the probability that a nominated event will occur using, as the basis for the estimate, averages obtained from data produced by the process at some time in the past. The concept of probability is therefore of primary importance in the study of random processes and the techniques used for describing data produced by such processes. An introduction to those probability measures which are most frequently encountered when analysing random data is provided in the Appendix presented. Author

N82-21107# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
ERROR ANALYSIS
In its AGARD Flight Test Instr. Ser., Vol. 14 Nov. 1981 p 155-160 (For primary document see N82-21099 11-82)
Avail: NTIS HC A08/MF A01

The results obtained from an analysis of random data are never exact. Thus two selections extracted from a recording made under nominally steady conditions will always yield different results. The magnitude and the character of the differences, or likely differences, between two such analyses are just as important as the results themselves if the results are to be interpreted with any degree of confidence. An outline of the method by which the errors associated with the analysis of random data may be estimated are contained in the appendix presented. The method is applied to the task of estimating the errors for several of the more familiar analysis techniques. M.D.K.

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

N82-21108# Naval Postgraduate School, Monterey, Calif.
AN ANALYSIS OF COST GROWTH IN THE F/A-18 AIRPLANE ACQUISITION PROGRAM M.S. Thesis
Joseph Wendell Dyer Dec. 1981 231 p refs
(AD-A109673) Avail: NTIS HC A11/MF A01 CSCL 15/3

This research analyzes the F/A-18 airplane acquisition program with respect to cost growth. It is noted that the development estimate of total program cost addressed the acquisition of only 800 airplanes, but that a decision was made in 1978 to increase the inventory objective to 1366 airplanes. Additionally, the estimates of inflation (escalation) issued by the Office of the Secretary of Defense are observed to be lower than the inflation actually experienced by the F/A-18 contractors. It is concluded that, as of December 1980, the program cost growth was only 10 percent when adjustments are made for both the quantity change and for actual inflation. It is further concluded that the program managers had little control over cost growth. Continued inflation and possible failure to realize the expected cost-quantity relationships are identified as likely areas of significant future cost growth. Author (GRA)

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

No abstracts in this category.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N82-21109# Sandia Labs., Albuquerque, N. Mex.
PERFORMANCE AND PUBLIC AWARENESS PROGRAMS FOR THE DOE/ALO ELECTRA VAN 600 Semiannual Report, Mar. - Oct. 1980
Richard R. Bassett Apr. 1981 24 p refs
(Contract DE-AC04-76DP-00789)
(SAND-81-0719) Avail: NTIS HC A02/MF A01

A Jet Industries Inc. Electra Van 600 was used to carry passengers and light cargo for the purpose of evaluating its onsite operation. Instrumentation was installed to measure operating parameters and determine efficiencies, and maintenance records were kept to document problems. The van was also part of a public awareness program to inform the public of the existence of electric vehicles. Evaluation procedures and test results regarding acceleration, speed, energy consumption, range, and gradeability are given. Repair and maintenance problems are also discussed. M.G.

N82-21110*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
RESEARCH AND TECHNOLOGY REPORT, 1981
1981 81 p refs
(NASA-TM-84158; NAS 1.15:84158) Avail: NTIS HC A05/MF A01 CSCL 05A

The Marshall Space Flight Center programs of research and technology for 1981 in various areas of aerospace science are

reviewed. Each activity reviewed has a high probability of application to current or future programs or is an application of the results of current programs. Projects in atmospheric and magnetospheric science, solar physics, astronomy, and space technology are included. R.J.F.

N82-21111# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
A PROCEDURE FOR DETERMINING THE RESOURCE UTILIZATION POTENTIAL OF COAL ASH M.S. Thesis
James F. Karasek Sep. 1981 140 p refs
(AD-A109877; AFIT-LSSR-58-81) Avail: NTIS HC A06/MF A01 CSCL 21/2

A combination of the increased utilization of coal as an energy source and more stringent environmental regulations is creating problems for the disposal of the ash by-product from the combustion of coal. Utilization of the coal ash as an alternate resource has proven to be a partial solution to the problem. The U.S. Air Force coal conversion program will increase coal consumption and the production of coal ash; this has a potential to create a disposal problem for coal-burning bases. The purpose of this thesis was to develop a procedure to aid an engineer in determining the resource utilization potential of the coal ash at the base. The quality and quantity of the ash are the two main factors that affect the resource utilization potential of the ash. These two factors are a function of the nature of the feed coal, and the production, collection, handling, and storage systems utilized at the base. The procedure does not address the determination of the market potential of the ash, but rather its potential to be utilized as an alternate resource. The procedure provides a sequence of steps to follow in determining the resource utilization potential of a coal ash.
Author (GRA)

88 SPACE SCIENCES (GENERAL)

No abstracts in this category.

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N82-21112 Wisconsin Univ. - Madison.
HIGH RESOLUTION INFRARED INTERFEROMETRY OF THE INTERSTELLAR MEDIUM Ph.D. Thesis
Peter Michael Ogden 1981 139 p
Avail: Univ. Microfilms Order No. 8124624

The development of the infrared Fabry-Perot astronomical program is discussed. The H2 1-0 S(1) vibrational rotational line at 2.12 microns from the direction of OMC-1. The instrumental resolution was approximately 10 km s. Data obtained on two occasions separated by about 10 months showed widely different results for the width of the line. A Fabry-Perot interferometer that is used primarily for observing the Br alpha hydrogen recombination line at 4.05 microns with a high enough spectral resolution and spectrometer is discussed, as are the likely sources of noise for this wavelength region. Because thermal noise is the dominant noise source, the spectrometer was designed to be operated while cryogenically cooled. Dissert. Abstr.

N82-21113 California Univ., Santa Cruz.
SPECTROPHOTOMETRY OF INTERMEDIATE AND HIGH-REDSHIFT QUASARS Ph.D. Thesis
C. Martin Gaskell 1981 157 p
Avail: Univ. Microfilms Order No. 8127997

Spectrophotometric observations of over 40 flat radio spectrum quasars are analysed. The broad OI, Mg II and Balmer lines are systematically redshifted by about 800 km/sec. In individual QSOs the broad and narrow lines often differ significantly in redshift, but there is no systematic difference for the QSOs as a whole. Analysis of ultraviolet line ratios implies a ratio of ionizing photons to gas which is an order of magnitude larger than usually assumed. Dielectronic recombination is proposed as a significant contributor to the C III line. The C III equivalent width is found to have an upper limit of 35 A regardless of the C IV strength. The profiles of the Ly alpha, C IV, Si IV, O IV and C III lines are identical except that there can be an additional narrow component of Ly alpha and the C III line always appears to be asymmetric because of probable blending with AL III, Si III and Fe II emission. Dissert. Abstr.

N82-21114 British Library Lending Div., Boston Spa (England).
A RESEARCH OF DOUBLE STARS IN T ASSOCIATIONS: PRELIMINARY RESULTS
M. M. Zakirov 24 Jun. 1981 6 p refs Transl. into ENGLISH from Astron. Tsirk. (USSR), no. 757, 1973 p 1-2
(BLL-M-28023-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

Stellar pairs in T associations were investigated using television and atlas charts of the sky. Twenty-four stellar pairs in the associations of Taurus T1, T2, T3, and 119 in Orion were discovered. The distribution of average distances between components of wide pairs in the investigated associations is presented. S.L.

N82-21115 British Library Lending Div., Boston Spa (England).
LINEAR DIAMETERS AND DISTANCES OF OPEN CLUSTERS
K. A. Barkhatova and O. P. Pylskaja 24 Jun. 1981 7 p Transl. into ENGLISH from Astron. Tsirk. (USSR), no. 995, 1978 p 4-7
(BLL-M-28022-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

The spatial distribution of open star clusters was studied. A growth of the linear diameters with increasing cluster distance from the Sun was observed. Possible causes of the revealed dependence include the influence of a selection effect when massive stellar aggregates are observed at greater distances, systematic errors in the measurements of angular diameters of the clusters, and the effect of evolution on the construction of the zero age main sequence. Considering the effect of each of the factors enumerated, boundary conditions were introduced and the dependence was examined separately for clusters of various ages. The values of the coefficients of the slope of the lines were determined and the reliability of the result was obtained depending on Stefan's constant in the solution of the systems of conditional equations by the least square method, formed for the clusters as a whole and for various age groups of the clusters. S.L.

N82-21116 British Library Lending Div., Boston Spa (England).
ON THE QUESTION OF CONCENTRATIONS OF A TYPE STARS
G. T. Kevanishvilli 24 Jun. 1981 7 p refs Transl. into ENGLISH from Astron. Tsirk. (USSR), no. 202, 1959 p 10-12
(BLL-M-28024-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.

The spatial distribution of stars of the spectral class A was investigated. The distance moduli were calculated and plotted according to chi and delta on a map. The intervals of the average distance are shown. Each part of the map represents a region of sky between two circles of declination (meridonal spherical lune). The well known O and T associations and the open star clusters are also shown. A galactic zone limited in glactic latitude to b = + or - 10 deg was marked. In all the lunes and their parts limited to b = + or - 10 deg, the surface densities of the stars are individually estimated. S.L.

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N82-21117*# Computer Sciences Corp., Silver Spring, Md.
ULTRAVIOLET LIGHT CURVES OF U GEMINORUM AND

VW HYDRI
Chi-Chao Wu, R. J. Panek, A. V. Holm, and F. H. Schiffer, III 1981 7 p refs
(Contracts NASw-3254; NAS5-25774)
(NASA-CR-168683; NAS 1.26:168683) Avail: NTIS HC A02/MF A01 CSCL 03B

Ultraviolet light curves were obtained for the quiescent dwarf novae U Gem and VW Hyi. The amplitude of the hump associated with the accretion hot spot is much smaller in the UV than in the visible. This implies that the bright spot temperature is roughly 12000 K if it is optically thick. The flux distribution of U Gem in quiescence cannot be fitted by model spectra of steady state, viscous accretion disks. The absolute luminosity, the flux distribution, and the far UV spectrum suggest that the primary star is visible in the far UV. The otical UV flux distribution of VW Hyi can be matched roughly by the model accretion disks. S.L.

N82-21118*# National Aeronautics and Space Administration, Washington, D. C.
GAMMA RAY ASTROPHYSICS: NEW INSIGHT INTO THE UNIVERSE
Carl E. Fichtel and Jacob I. Trombka Washington 1981 405 p refs Original contains color illustrations
(NASA-SP-453; NAS 1.21:453; LC-81-600116) Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

Gamma ray observations of the solar system, the galaxy and extragalactic radiation are reported. Topics include: planets, comets, and asteroids; solar observations; interstellar medium and galactic structure; compact objects; cosmology; and diffuse radiation. The instrumentation used in gamma ray astronomy in covered along with techniques for the analysis of observational spectra. For individual titles, see N82-21119 through N82-21132.

N82-21119*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GAMMA RAY ASTRONOMY IN PERSPECTIVE
In its Gamma Ray Astrophys. 1981 p 1-14 refs (For primary document see N82-21118 11-90)
Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

A brief overview of the development of gamma ray astronomy is presented. Gamma ray telescopes and other optical measuring instruments are highlighted. Emphasis is placed on findings that were unobtainable before gamma ray astronomy. Information on evolution of the solar system, the relationship of the solar system to the galaxy, and the composition of interstellar matter is discussed. T.M.

N82-21120*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GAMMA RAY OBSERVATIONS OF THE SOLAR SYSTEM
In its Gamma Ray Astrophys. 1981 p 19-24 refs (For primary document see N82-21118 11-90)
Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

Two general categories are discussed concerning the evolution of the solar system: the dualistic view, the planetesimal approach; and the monistic view, the nebular hypothesis. The major points of each view are given and the models that are developed from these views are described. Possible applications of gamma ray astronomical observations to the question of the dynamic evolution of the solar system are discussed. T.M.

N82-21121*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PLANETS, COMETS, AND ASTEROIDS
In its Gamma Ray Astrophys. 1981 p 25-66 refs (For primary document see N82-21118 11-90)
Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

Methods for remote sensing of elemental composition of the surfaces of planets, comets, and asteroids are considered. The abundance of certain elements with different condensation temperatures and with various types of geochemical behavior provide data relative to the origin and evolution of these bodies. Solar X-ray fluorescence, and primary and secondary galactic cosmic ray interactions are highlighted as the major remote sensing methods. T.M.

N82-21122*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR OBSERVATIONS
In its Gamma Ray Astrophys. 1981 p 67-94 refs (For primary document see N82-21118 11-90)
Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

High energy processes that take place in the Sun's atmosphere and the relationship of these phenomena to the basic problems of solar activity are discussed. Gamma ray emission exhibits characteristics of the conditions in regions where accelerated high energy particles interact. A number of gamma ray production mechanisms are considered. These include: the Compton effect, magnetobremsstrahlung, pi meson production by proton-proton interaction or by proton-antiproton annihilation, fission and neutral of charged particle radiative capture on inelastic scatter. T.M.

N82-21123*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE INTERSTELLAR MEDIUM AND GALACTIC STRUCTURE
In its Gamma Ray Astrophys. 1981 p 99-130 refs (For primary document see N82-21118 11-90)
Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

High energy gamma rays are produced by the interaction of cosmic rays with the interstellar matter in the galaxy. By combining the gamma ray information with radio data, a picture of the galaxy is presented with regard to the general structure and the effects of cosmic ray pressure. The interaction processes and galactic matter distribution are discussed. Galactic cosmic ray distribution and current gamma ray results are reported. T.M.

N82-21124*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COMPACT OBJECTS
In its Gamma Ray Astrophys. 1981 p 131-159 refs (For primary document see N82-21118 11-90)
Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

Various types of objects and phenomena and their significance in high energy astrophysics are discussed. The current concepts of the nature of the objects and the mechanisms generating high energy electromagnetic radiation are also discussed. Current observational data is presented. Objects of special interest include black holes, supernova remnants, neutron stars, and pulsars. T.M.

N82-21125*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GALAXIES
In its Gamma Ray Astrophys. 1981 p 165-185 refs (For primary document see N82-21118 11-90)
Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

Normal galaxies, radio galaxies, and Seyfert galaxies are considered. The large magellanic cloud and the great galaxy in Andromedia are highlighted. Quasars and BL lacertae objects are also discussed and a review of the spectral observations of all of these galaxies and celestial objects is presented. T.M.

N82-21126*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COSMOLOGY
In its Gamma Ray Astrophys. 1981 p 187-201 refs (For primary document see N82-21118 11-90)
Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

The current view of the universe is summarized. The equations used to described it and the means of interpreting the diffuse gamma radiation which might result from phenomena which occurred in the distant past are described. The Friedmann model is described in detail. T.M.

N82-21127*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIFFUSE RADIATION
In its Gamma Ray Astrophys. 1981 p 203-228 refs (For primary document see N82-21118 11-90)
Avail: NTIS HC A01; SOD HC $10.00 CSCL 03B

A diffuse celestial radiation which is isotropic at least on a course scale were measured from the soft X-ray region to about 150 MeV, at which energy the intensity falls below that of the

galactic emission for most galactic latitudes. The spectral shape, the intensity, and the established degree of isotropy of this diffuse radiation already place severe constraints on the possible explanations for this radiation. Among the extragalactic theories, the more promising explanations of the isotropic diffuse emission appear to be radiation from exceptional galaxies from matter antimatter annihilation at the boundaries of superclusters of galaxies of matter and antimatter in baryon symmetric big bang models. Other possible sources for extragalactic diffuse gamma radiation are discussed and include normal galaxies, clusters of galaxies, primordial cosmic rays interacting with intergalactic matter, primordial black holes, and cosmic ray leakage from galaxies. T.M.

N82-21128*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GAMMA RAY INTERACTION PROCESSES
In its Gamma Ray Astrophys. 1981 p 229-246 refs (For primary document see N82-21118 11-90)
Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

Gamma ray detection in the energy region above 1 keV involves measurements of the energy exchange or energy loss between the gamma ray and the mass of the detector. In most cases of interest, it is the kinetic energy imparted to charged particles by the gamma ray which is lost in the detector and measured in order to obtain spectral knowledge between the incident gamma ray photon and the direction of the secondary particles contains important energy information. The interaction gamma ray removal processes in matter are considered. This interaction removal process is characterized by the fact that each gamma ray is removed individually from the incident beam. The number of photons removed in this manner is proportional to the thickness of matter traversed. T.M.

N82-21129*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DETECTORS FOR ENERGIES LESS THAN 10 MeV
In its Gamma Ray Astrophys. 1981 p 247-303 refs (For primary document see N82-21118 11-90)
Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

In the energy domain 100 keV to 10 MeV, both crystal scintillations and semiconductors are widely used for gamma ray detectors in spectrometer systems. These detectors' operation depend on the fact that gamma rays lose energy by ionization in these materials and electrons and holes are produced. In the case of semiconductors, these electrons and holes are collected by an electric field, and they provide an electric signal that is a direct measure of the energy lost by the gamma ray in the material. Scintillation detectors depend on a further conversion of the energy lost in electron hole pair production to the production of photons. A photomultiplier tube measures the intensity of the photon flux, and an electrical pulse proportional to the photon intensity is produced at the photomultiplier output. T.M.

N82-21130*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DETECTORS FOR ENERGIES GREATER THAN 10 MeV
In its Gamma Ray Astrophys. 1981 p 305-336 refs (For primary document see N82-21118 11-90)
Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

The detector telescopes used in gamma ray astronomy in general are more similar to particle detectors than to optical devices, since the high frequency of the radiation precludes the use of reflection or diffraction techniques, but the high energy content of each photon does enable them to be detected with scintillators, track imaging chambers, and solid state detectors. Within the gamma ray range, the basic design of the instrument changes as the energy of the gamma ray exceeds 10 to 20 MeV, and therefore, moves from the region where the Compton effect predominates in the absorption of the gamma ray to that where electron pair production is most important. In the energy range from 10 to 20 MeV to several times 10,000 MeV, gamma ray telescopes are usually built so that the electron pair may be seen and the properties of the electrons measured. T.M.

N82-21131*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ANALYSIS OF OBSERVATIONAL SPECTRA
In its Gamma Ray Astrophys. 1981 p 337-382 refs (For primary document see N82-21118 11-90)
Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

The first step in the analysis of gamma ray energy loss spectra is their conversion to differential energy and differential angular photon spectra. This conversion can be carried out if the detector response and the background are both known. Once these parameters are known, there are many techniques that can be used to convert pulse height spectra to photon spectra. These techniques are discussed and background problems are considered. Emphasis is placed on the analysis of energy loss spectra in the lower gamma ray energy domain. Problems of transportations from pulse height to photon space are most complex in this domain and the methods shown illustrate many of the problems which arise in the general analysis of energy loss spectra. T.M.

N82-21132*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROSPECTS FOR GAMMA RAY ASTRONOMY c70
In its Gamma Ray Astrophys. 1981 p 385-389 refs (For primary document see N82-21118 11-90)
Avail: NTIS MF A01; SOD HC $10.00 CSCL 03B

The Solar Maximum Mission and the Gamma Ray Experiment aboard the SMM spacecraft are discussed. Mission plans for interplanetary probes are also discussed. The Gamma Ray observatory and its role in future gamma ray astronomy is highlighted. It is concluded that gamma ray astronomy will be of major importance in the development of astronomical models and in the development of cosmological theory. T.M.

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N82-21133# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).
THE DISTRIBUTION OF NEUTRAL GAS FROM A COMET [DISTRIBUICAO DO GAS NEUTRO DE UN COMETA]
Samuel deSouza and Rene A. Medrano-B Jun. 1981 11 p refs In PORTUGUESE; ENGLISH summary Presented at 33rd Reuniao Ann. da SBPC, Salvador-Bahia, Brazil, 8-15 Jul. 1981 (INPE-2136-RPE/359) Avail: NTIS HC A02/MF A01

Exact solutions for the number density of the neutral particles outgassing from the comet nucleus are obtained. The formation of the cometary ionosphere, and hence of the shock wave and tangential discontinuity, on the Sun side of the comet are affected by the neutrals after they become ionized. The solutions correspond to the continuity equation of the comet's neutral gas and take into consideration the effect due to the radiation pressure of the Sun. The results obtained suggest that both the shock wave and the contact discontinuity are farther apart from the comet nucleus than previously assumed. S.L.

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N82-21134*# Universities Space Research Association, Boulder, Colo.
TERRESTRIAL COOLING AND SOLAR VARIABILITY Final Report
Ernest M. Agee 5 Feb. 1982 55 p refs Revised
(Contract NAS8-34010)
(NASA-CR-161985; NAS 1.26:161985) Avail: NTIS HC A04/MF A01 CSCL 03B

Observational evidence from surface temperature records is

presented and discussed which suggests a significant cooling trend over the Northern Hemisphere from 1940 to the present. This cooling trend is associated with an increase of the latitudinal gradient of temperature and the lapse rate, as predicted by climate models with decreased solar input and feedback mechanisms. Evidence suggests that four of these 80- to 100-year cycles of global surface temperature fluctuation may have occurred, and in succession, from 1600 to the present. Interpretation of sunspot activity were used to infer a direct thermal response of terrestrial temperature to solar variability on the time scale of the Gleissberg cycle (90 years, an amplitude of the 11-year cycles). A physical link between the sunspot activity and the solar parameter is hypothesized. Observations of sensible heat flux by stationary planetary waves and transient eddies, as well as general circulation modeling results of these processes, were examined from the viewpoint of the hypothesis of cooling due to reduced insolation. A.R.H.

N82-21135*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STATISTICAL ASPECTS OF THE 1980 SOLAR FLARS. 1: DATA BASE, FREQUENCY DISTRIBUTIONS, AND OVERVIEW REMARKS
Robert M. Wilson Jan. 1982 109 p refs
(NASA-TM-82465; NAS 1.15:82465) Avail: NTIS HC A06/MF A01 CSCL 03B

All1349 H alpha flares occurring in 1980 which have known start, maximum brightness, and end times, latitudes, and associated importance and X-ray classes were used to perform a statistical study of flare rise time, decay time, duration, latitude, importance (areal and relative intensity), and X-ray class. Frequency distributions of these parameters are tabulated and plotted. Author

N82-21136# California Univ., San Diego. Dept. of Electrical Engineering and Computer Sciences.
THE THREE-DIMENSIONAL STRUCTURE OF THE SOLAR WIND FROM RADIO SCINTILLATIONS Final Report, 25 Feb. 1977 - 30 Sep. 1981
B. V. Jackson and A. Nagendran Apr. 1981 44 p refs
(Contract F19628-77-C-0161; AF Proj. 2311)
(AD-A108152; AFGL-TR-81-0039) Avail: NTIS HC A03/MF A01 CSCL 03/2

Since 1972 the UCSD 74 MHz radio observatory has continuously monitored the solar wind using the method of interplanetary scintillation (IPS). The two reports presented here bear on the problems involved in tracing the fast changing three dimensional structure of the solar wind from the solar surface out to the vicinity of the Earth. The interplanetary scintillation technique is a radio propagation method for studying the velocity and small scale (approximately 100 to 1000 km) turbulence in the solar wind. The signals are cross-correlated from three spaced antennas to yield time offsets from which the speed of the scintillation pattern can be deduced. Comparisons of IPS observations with spacecraft measurements have shown excellent agreement when the IPS source lies in the ecliptic plane. Furthermore, observations can be made in the direction of many radio sources (almost) simultaneously so as to generate a three-dimensional map of the solar wind. The eight-year data base is important for correlative studies throughout the solar cycle. In our analysis we emphasize three time scales are emphasized: (1) the solar cycle evolution of six month average velocity structures; (2) studies of one solar rotation duration; and (3) variations in the solar wind structure on time scales of a few days. GRA

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

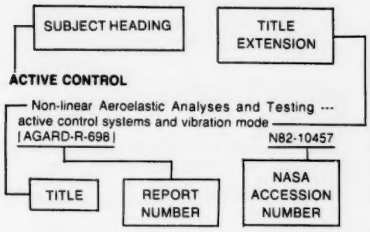
N82-21137 Pennsylvania State Univ., University Park.
A MODEL FOR GAMMA-BURSTS Ph.D. Thesis
Chin-Yuan Mao 1981 131 p
Avail: Univ. Microfilms Order No. 8129180

A gamma-burst model is proposed. When white dwarf stars increase their masses by accretion from either binary companions or interstellar clouds, they become unstable. Under favorable conditions, neutronization in the interior dominates thermal runaway due to pycnonuclear reactions, so the white dwarf will nonexplosively collapse into a neutron star. In this scenario, energy transport and radiation, which may manifest themselves are investigated. In the proposed model the core of a magnetized white dwarf star collapses homologously, while the mantle trails behind. Owing to the degeneracy of neutrons, the collapse halts, and this results in a collapse shock, the strength of which depends on the mass and velocity of the mantle. The shock comes out of the star and is accelerated into a relativistic shock by a steep atmosphere. The energetic matter behind the shock interacts with the strong magnetic field, emitting powerful synchrotron and thermal radiation. Dissert. Abstr.

99 GENERAL

No abstracts in this category.

Typical Subject Index Listing



The subject heading is the key to the subject content of the document. Titles, report numbers, and accession numbers of pertinent documents are provided under each subject heading. When the title is insufficiently descriptive of the document content, a title extension has been added, separated from the title by three hyphens. The report number helps to indicate the type of document cited (e.g., NASA report, NASA translation, NASA contractor report). The NASA accession number is the number by which the document abstracts are arranged in this journal and by which the document is sold or requested. The titles, with title extensions if present, are arranged under each subject heading in ascending accession number order. The subject headings have been selected from the latest revision of the *NASA Thesaurus* (NASA SP-7050).

A

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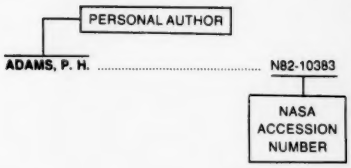

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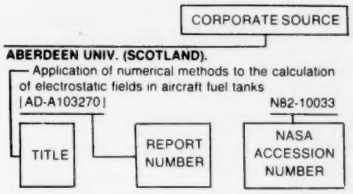

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A

ACUREX CORP., MOUNTAIN VIEW, CALIF.
Advanced pulverized-coal combustor for control of NO sub x emissions
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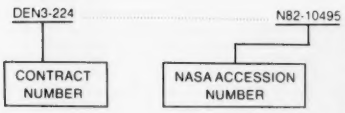

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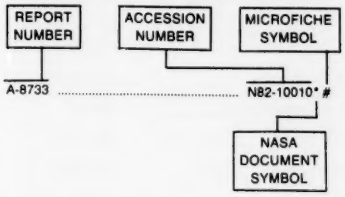

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